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Training Manual
(TRAMAN)



SEABEE Combat Handbook

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The terms training manual (TRAMAN) and nonresident training course (NRTC) are now the terms used to describe Navy nonresident training program materials. Specifically, a TRAMAN includes a rate training manual (RTM), officer text (OT), single subject training manual (SSTM), or modular single or multiple subject training manual (MODULE); and a NRTC includes nonresident career course (NRCC), officer correspondence course (OCC), enlisted correspondence course (ECC) or combination thereof.

Although the words "he," "him," and "his" are used sparingly in this manual to enhance communication, they are not intended to be gender driven nor to affront or discriminate against anyone reading this text.

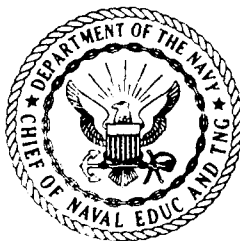
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SEABEE COMBAT HANDBOOK

NAVEDTRA 10479-C3



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1995 Edition Prepared by
SWC Patrick J. Essinger



PREFACE

This training manual (TRAMAN) and nonresident training course (NRTC) form a self-study package that will enable the enrollees to gain information which will help them fulfill the requirements of their rating.

Designed for individual study and not formal classroom instruction, the TRAMAN provides subject matter that relates directly to the occupational qualifications of the SEABEE ratings. The NRTC provides the usual way of satisfying the requirements for completing the TRAMAN. The set of assignments in the NRTC includes learning objectives and supporting items designed to emphasize the key points covered in the TRAMAN.

This training manual and nonresident training course were prepared by the Naval Education and Training Program Management Support Activity, Pensacola, Florida, for the Chief of Naval Education and Training. Technical assistance was provided by the Naval Facilities Engineering Command, Alexandria, Virginia; the Naval Construction Battalion Center and the Naval Construction Center, Port Hueneme, California; the Naval Construction Battalion Center, the Naval Construction Training Center, and the 20th Naval Construction Regiment, Gulfport, Mississippi; the Naval Construction Battalions, U.S. Pacific Fleet, Pearl Harbor, Hawaii; and the Naval Construction Battalions, U.S. Atlantic Fleet, Naval Amphibious Base, Little Creek, Norfolk, Virginia.

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THE UNITED STATES NAVY

GUARDIAN OF OUR COUNTRY

The United States Navy is responsible for maintaining control of the sea and is a ready force on watch at home and overseas, capable of strong action to preserve the peace or of instant offensive action to win in war.

It is upon the maintenance of this control that our country's glorious future depends; the United States Navy exists to make it so.

WE SERVE WITH HONOR

Tradition, valor, and victory are the Navy's heritage from the past. To these may be added dedication, discipline, and vigilance as the watchwords of the present and the future.

At home or on distant stations we serve with pride, confident in the respect of our country, our shipmates, and our families.

Our responsibilities sober us; our adversities strengthen us.

Service to God and Country is our special privilege. We serve with honor.

THE FUTURE OF THE NAVY

The Navy will always employ new weapons, new techniques, and greater power to protect and defend the United States on the sea, under the sea, and in the air.

Now and in the future, control of the sea gives the United States her greatest advantage for the maintenance of peace and for victory in war.

Mobility, surprise, dispersal, and offensive power are the keynotes of the new Navy. The roots of the Navy lie in a strong belief in the future, in continued dedication to our tasks, and in reflection on our heritage from the past.

Never have our opportunities and our responsibilities been greater.

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REGULATIONS ON ENVIRONMENTAL POLLUTION AND HAZARDOUS MATERIALS

Environmental Pollution and Hazardous Waste Handling and Disposal programs have been enacted and are United States law. These programs are of immense importance and should be taken into consideration during the planning stages before beginning any new construction or rehabilitation project.

As a member of the Naval Construction Forces, United States law requires you to be constantly aware of potential environmental pollution hazards or hazardous material spills and to report them to your immediate supervisor or other senior personnel at the earliest possible time.

The following list of directives contains information on the cognizant government departments and the procedures for preventing, reporting, and correcting environmental pollution hazards and hazardous materials disposal worldwide:

- **Naval Occupational Safety and Health Program Manual, OPNAVINST 5100.23B**
- **Environmental and Natural Resources Protection Manual, OPNAVINST 5090.1**
- **Navy Environmental Support Office Manual, 20.2-011**
- **NAVFAC Pollution Control Manual, DM-5.8**

CHAPTER 1

HISTORY AND ORGANIZATION OF THE SEABEES

The SEABEE combat readiness occupational standards in the front of this manual were current when this manual was published and distributed. Since occupational standards may change each year, be sure you see your ESO for the up-to-date standards.

HISTORY OF THE SEABEES

The SEABEES are the Navy's construction forces; and few select teams, if any, enjoy a finer reputation among America's fighting men. During their short history, the SEABEES have won fame, honor, and distinction as an organization that "Can Do," even when faced with practically insurmountable obstacles. A brief discussion on the history of the SEABEES is given below.

THE CIVIL ENGINEER CORPS

No discussion on the history of the SEABEES is complete without first explaining the origin and purpose of the Civil Engineer Corps (CEC). The CEC is composed of dedicated staff corps officers who are specialists in the field of civil engineering. A CIVIL ENGINEER is a professional engineer who performs a variety of engineering work in planning, designing, and overseeing construction and maintenance of structures and facilities, such as roads, airports, bridges, harbors, pipelines, power plants, and water and sewage systems.

Civil engineers have been an integral part of the Navy since its very beginning. Our first "fleet" consisted of less than 10 ships. However, our forefathers realized that to survive as a nation, the United States must have a Navy powerful enough to counter the naval threat from pirates and other great powers, such as England, France,

and Spain. To meet this threat, Congress authorized the hiring, purchasing, and building of several additional vessels. Suitable land for use as navy yards had to be located, surveyed, and purchased. Logically, civil engineers were delegated to perform these tasks.

By the time Thomas Jefferson became President, the Secretary of the Navy, Mr. Stoddert, had established six navy yards. All were managed by civil engineers, although they were not yet known as Civil Engineer Corps officers. In the following years, the number of ships increased sharply as well as the need for more dry docks and repair facilities. The United States was emerging as a great sea power and governmental functions were becoming more complex. As a result, on 31 August 1842, Congress established the "Bureau" system. The Bureau of Yards and Docks (BUDOCKS)—known now as the Naval Facilities Engineering Command (NAVFAC)—was created, and the chief of this bureau was a civil engineer. It was not until 25 years later, however, that the Civil Engineer Corps was officially named and authorized. The officers in the corps at that time were the forerunners of the CEC officers who lead the variety of SEABEE units today.

As naval technology advanced in the modern era, the navies of the world ranged far over the great oceans. Ships grew more and more dependent upon an ever increasing chain of sophisticated shore bases for their support both at home and abroad. The construction of these bases necessitated a new and large organization of seafaring fighter-builders.

Before 1941, the Civil Engineer Corps utilized private contractors to accomplish all overseas construction. The contractors, in turn, hired steelworkers, electricians, carpenters, draftsmen,

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and mechanics from private industry. However, the Navy realized that, in the event of war, civilian contractors and construction workers could not be used very well outside our own country. If they were attacked and attempted to defend themselves, these civilians could be regarded as guerillas. Also, since most of them had never received any type of combat training, there was reason to believe that they could not adequately defend themselves even if their lives depended on it. These fears soon became realities.

As World War II drew near, there was an urgent need for more overseas bases. Airfields and landing strips had to be rushed into existence on far away islands. Clearly, we needed a combat MILITARY ORGANIZATION trained to construct these advance bases. Even before the outbreak of hostilities, the Bureau of Yards and Docks had conceived the idea of naval construction battalions. The first construction units were organized early in January 1942. Highly skilled construction workers were recruited, and whole construction companies volunteered men and equipment.

THE FIRST SEABEES

The name SEABEES is derived from these first construction units, or construction battalions (CBs) as they were called. Officially, permission to use the name "SEABEE" was granted on 5 March 1942. Each year March 5th is observed as the anniversary of the SEABEES.

Because of the urgent need for these men, the first SEABEES had no time for military training. They were given medical shots, handed equipment, and sent off to pick up where the civilian contractors left off. One month after the first units were organized, SEABEES were at work constructing roads on Bora Bora, one of the Society Islands, thousands of miles out in the Pacific Ocean.

Little time was given to training the next group of recruits, who were old hands in the construction trades, averaging 31 years of age. Since they were experienced in their respective skills, they needed and received mostly military training. Some additional instruction in technical matters peculiar to the Navy, such as pontoon assembly, was also given these men.

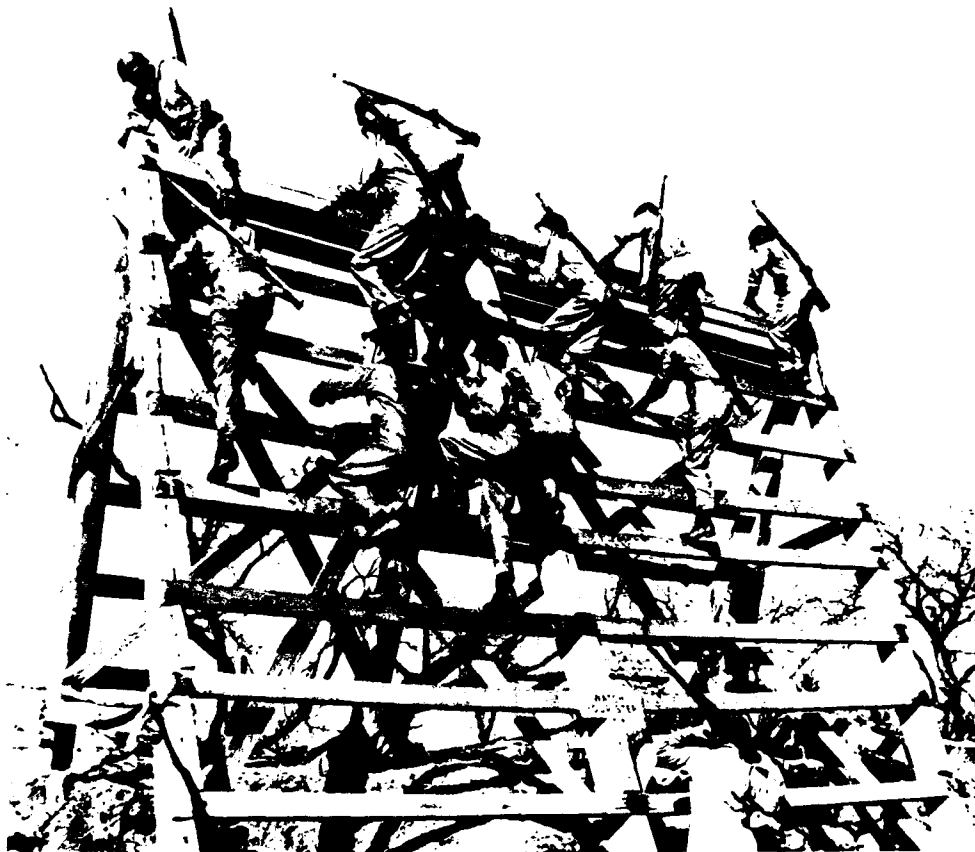
Throughout World War II the SEABEES were without construction ratings as we know them now. They were given the most appropriate existing Regular Navy rating on the basis of their civilian vocation and experience. For example, an experienced steelworker or plumber who had achieved a position of responsibility—perhaps as a foreman or owner of a small business—was rated first class or chief shipfitter. SEABEES who held this and other ratings, such as boatswain's mate, machinist's mate, and electrician's mate, were easily distinguished from those who held corresponding shipboard ratings by the SEABEE insignia shoulder patch. This now famous insignia consists of a flying bee—fighting mad—with a "white hat" on his head, a spitting "tommy gun" in his front hands, a wrench in his middle hand, and a carpenter's hammer in his rear hand.

Soon the SEABEES had grown enough to have their own stations, such as Camp Endicott, Camp Alien, and Camp Bradford. Camp Peary, near Williamsburg, Virginia, became the receiving and training station for the SEABEES. At these camps, they learned such things as combat formations, combat signals, fire control, combat orders, first aid, use of various weapons, and military courtesy. Instruction was also given in trail cutting and jungle warfare.

After boot training, the new SEABEES were assigned to construction battalions and advanced training began. They learned air raid protection, earth-moving, quonset hut erection, and dry refrigeration. Cross-country marches, sleeping in the open, obstacle courses (fig. 1-1), and simulated combat exercises toughened them up.

After this advanced training, battalions were ordered to an advanced base depot, such as Port Hueneme, California, or Davisville, Rhode Island, to await transportation overseas. Again, training continued while they were being outfitted with the tools, construction equipment, and materials needed to build advanced bases and facilities. In addition, they took on stores of ammunition, food, and medical supplies—in fact, everything necessary to make them self-sufficient.

By 1943, the training period for SEABEES had expanded to about three months. However, in the spring of 1945, a major change in their training took place: Training of organized construction battalions was halted, and emphasis was placed on training individuals to replace the



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Figure 1-1.—SEABEES going over one of the obstacle courses during combat training at Camp Endicott, Davisville, Rhode Island, during World War II.

battle-weary veterans due for discharge or rotation back to the States. Even then, time did not permit extensive trade school training for the younger, unskilled Selective Service inductees. As a result, experienced personnel in the field had to augment meager stateside training with a lot of on-the-job training.

SEABEES served with the assault forces in almost every major invasion in World War II, going ashore in most cases with or directly behind the first wave of troops. Such names as Guadalcanal, Los Negros, Tarawa, Munda, Saipan, Tinian, Attu, Iwo Jima, Guam, Samar, Okinawa, Salerno, Sicily, and Normandy will forever be associated with the SEABEES, just as Montezuma and the Shores of Tripoli are symbolic of the traditions associated with the Marine Corps.

Looking back some of the jobs accomplished by the SEABEES in World War II seemed almost impossible. But they were done—efficiently, effectively, and quickly!

Undoubtedly, these accomplishments provided the basis for the SEABEES' famous quotation:

"The difficult task we accomplish right away, the impossible may take a little longer!"

By the way, the SEABEES' official motto is "Construimus-Batuimus." Literally this means "We Build-We Fight." Even engineers who were used to visualizing large construction projects were amazed at the SEABEES' ability to improvise and build. In the first two years of

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the war, more than 300 advanced bases of various sizes and kinds were constructed by the SEABEES.

In addition to earning the Navy's traditional "Well done!" for construction work and defensive combat, the SEABEES also earned well-deserved recognition in other capacities. The now famous underwater demolition teams (UDTs) were composed largely of SEABEES. One large group of SEABEES, called Naval Construction Battalions, Special, functioned as stevedores, loading and off-loading cargo ships. Other groups included automotive repair detachments, pontoon assembly detachments, pontoon operating battalions, and construction maintenance units. The latter maintained existing bases, releasing full battalions for building new ones.

POST WORLD WAR II SEABEES

Since World War II, SEABEES have participated in all kinds of training exercises. They have been part of the naval Antarctic expeditions, and they participated in the atomic bomb tests on the Pacific Islands. SEABEES have engaged in constructing overseas bases, such as those at Subic Bay, Philippines, and the Marine Corps Air Facility at Futema, Okinawa. They have manned Arctic test stations, and they have been associated with resupply expeditions to Alaska.

SEABEES IN KOREA

In Korea, the SEABEES rose to the challenge of the Cold War in the tradition of their "Can Do" predecessors. At the Inchon landing in September 1950, SEABEES positioned pontoon causeways within hours of the first beach assault under continuous enemy fire and in the face of enormous and strong tides.

In addition to amphibious operations, the SEABEES were broken up into numerous detachments to service the K-fields of the various Marine air groups. Each airfield of the Marine air groups was designated with a "K" number, such as K-3 at Pohang, K-18 at Kimpo, Seoul, and K-2 at Teagan. As the war continued, the need arose for an advance airfield to retrieve damaged aircraft unable to reach home bases or carriers after raiding the North Korean interior.

The project was code named Operation "Crippled Chick", and a detachment of SEABEES was sent to Yo Do in the Bay of Wonson to build an airstrip. The SEABEES were given 35 days to complete the job—the strip was ready in 16 days. While building the strip, the SEABEES were under constant artillery bombardment from enemy forces on neighboring islands.

The rapid demobilization that followed World War II was not repeated after the signing of the Korean Armistice in July 1953. The Cold War had created a necessity to maintain military strength and preparedness. Crises in Berlin, Cuba, Africa, South America, and especially in Southeast Asia kept the SEABEES strong and active.

Just before the outbreak of the Korean War, a basic reorganization was substantially completed. Two distinct types of battalions were established to gain specialization and mobility. The amphibious construction battalions (PHIBCBs) are landing and docking units. The PHIBCBs have the mission of planning causeways, constructing pontoon docks, and performing other functions necessary for landing personnel and equipment in the shortest possible time. The mobile construction battalions (NMCBs) are responsible for land construction of a wide variety that includes military camps, roads, bridges, tank farms, airstrips, and docking facilities.

BETWEEN KOREA AND VIETNAM

After the Korean War, the SEABEES' efforts were directed toward more building and less fighting. Their peacetime achievements were no less impressive than their wartime achievements. In Okinawa, for example, the SEABEES built a Marine Corps air facility using concrete precasting methods that drew the admiration of contractors throughout the Pacific area. At Holy Lock, Scotland, SEABEES assembled a floating dry dock for the Polaris submarine facility. In far off Antarctica, a group of SEABEES earned a round of tributes for their installation of the first nuclear reactor power plant at McMurdo Station, despite weather conditions that are laughingly called "summer" in the forbidding region. Elsewhere, while Ecuadorians were building a new naval academy, a small detachment of SEABEES

supervised and instructed them in modern construction methods.

By far the largest and most impressive peacetime project was the construction of Cubi Point Naval Air Station in the Philippines, the largest single construction job ever tackled by the SEABEES. At Cubi, SEABEES cut a mountain in half to make way for the nearly two-mile long runway, blasted coral, and filled in a section of Subic Bay that is almost a mile wide and nearly two miles long. The SEABEES took nearly five years and 20 million man-hours to construct the air station and its adjacent aircraft carrier pier that is capable of docking the Navy's biggest aircraft carriers. The amount of coral and fill required for the job—some 20 million cubic yards—was equal to the task of building the Panama Canal.

During this period, SEABEES could be found everywhere. They participated in building missile ranges both in the Atlantic and the Pacific and housing complexes at naval bases and stations all over the world. During the Cuban Missile Crisis in 1962, SEABEES hastily erected and helped man a strong defensive perimeter of fortifications at Guantanamo Bay.

Disaster relief became more than just another mission. When the island of Guam was devastated by Typhoon Karen in 1962, SEABEES restored power and rebuilt damaged structures. Another team of SEABEES helped the Chilean Navy repair the earthquake-damaged waterfront of their principal shipyard. Later in 1964, SEABEES were on the scene restoring utilities and rebuilding roads in a matter of hours after Alaska was stricken by a devastating earthquake and tidal wave.

SEABEES IN VIETNAM

In South Vietnam, the SEABEES built and fought and established a new reputation for their deeds of construction while under fire. From the Demilitarized Zone (DMZ) in the north to the delta region in the south, they supported combat operations and sometimes fought side-by-side with the United States Marines and Army troops in guerrilla-infested areas.

The first full SEABEE battalion arrived in Vietnam on 7 May 1965 to build an expeditionary airfield for the Marines at Chu Lai. Others soon followed. From 1965 until 1969, the SEABEE

commitment in Southeast Asia rapidly increased. This necessitated, first, the transfer of Atlantic Fleet battalions to the Pacific through a change of home port; then, the deployment to the Republic of Vietnam (RVN) of Atlantic Fleet NMCBs; and later the reactivation of nine additional battalions. This was culminated by the call to active duty of two Reserve NMCBs in May of 1968, bringing to 21 the number of battalions deploying to RVN. In addition, there were two amphibious construction battalions lending support to the RVN effort. In the same time period, a requirement for SEABEES to support in-country activities, such as naval support activities at Da Nang and Saigon, two construction battalion maintenance units, two deployed naval construction regiments, and the deployed Third Naval Construction Brigade rapidly increased. To support these various requirements, the total SEABEE community grew from 9,400 in mid-1965; to 14,000 in mid-1966; to 20,000 in mid-1967; to more than 29,000 in 1968 and 1969.

SEABEE accomplishments in Vietnam were impressive, just as they were in World War II, Korea, and during peacetime. All 21 active battalions deployed to Vietnam—some several times—to build the roads, airfields, cantonments, warehouses, hospitals, storage facilities, bunkers, and other facilities needed to continue the struggle. In accordance with the "mobile" concept of the Naval Construction Force, SEABEE units supported Marine, Navy, Army, and Air Force operations at camps and landing zones throughout RVN and at such outposts as Con Thien, Khe Sanh and Gio Linh.

For their efforts in Vietnam, SEABEE units and individual SEABEES received formal recognition in the form of numerous commendations and medals.

In Vietnam, a SEABEE, CM3 Marvin E. Shields, a member of SEABEE Team 1104, was posthumously awarded the Medal of Honor. This nation's highest recognition was awarded to CM3 Shields for his heroic efforts in the defense of a Special Forces camp and Vietnamese District Headquarters at Dong Xoai.

When de-escalation of U.S. activity in Southeast Asia got underway, SEABEE strength was once more reduced. By September 1970, NMCBs were down to the planned post-RVN level

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of 10 full size battalions. SEABEES once more were being called upon to undertake major peacetime projects that had been deferred or neglected because of wartime priorities.

POST VIETNAM

Today's SEABEES are involved in new and far-reaching construction frontiers, the Indian Ocean, the Trust Territories of the Pacific Islands, and on the ocean floor.

One of the major peacetime projects ever undertaken by the SEABEES is the complete development, construction, and operation of the United States communications station on Diego Garcia in the Indian Ocean. Construction was started in early 1971.

Prior to 1971, Diego Garcia was a jungle-covered atoll devoid of activity except for a small meteorological station and a copra plantation. Today, it is a busy naval support activity, all due to the largest peacetime construction effort ever accomplished by the SEABEES. This tremendous effort ultimately involved some 14 naval construction force (NCF) commands, 17 battalion deployments, and over 60 individual detachment deployments. The SEABEES completed over 200 Navy and Air Force projects, valued at over \$200 million.

NMCB 40, the first detachment of SEABEES involved in this effort, deployed by amphibious ship to Diego Garcia in March 1971. They landed on the beach and quickly cleared temporary camp areas. Next, they cleared 15 acres of jungle, which was later used for more permanent structures. They also completed a 3,500 foot-long, C-130 capable airstrip and carved a four-mile road network out of the jungle.

Those early years presented many challenges—remote location, difficult on-site conditions, adverse weather, extreme heat, material delivery delays, numerous design changes, and problems establishing a 13,000 mile logistic pipeline. Despite these hardships SEABEES completed 85% of construction on nine major industrial and support buildings. They cleared 210 acres; and during the preparation of a permanent runway base, removed 200,000 cubic yards of unsuitable material and placed 300,000 cubic yards of coral. All tested the SEABEE "Can Do" motto.

Priorities and world situations changed however, and what had originally been a three-year mission for the SEABEES was extended. After building an austere communications station, the SEABEES were now tasked with building Diego Garcia to provide broader support for U.S. ships and aircraft in the Indian Ocean.

By mid-1975, the SEABEES had completed an entire Naval Construction Force camp, which included berthing, messing, shops, storage, utilities, and recreation facilities. Diego Garcia had become a minor naval activity with a permanent airfield; air operations buildings; navigational aides; additional communications facilities; harbor operation facilities; a large port of loading causeway with petroleum, oil, and lubricating (POL) facilities; telephone systems; water distribution; power and electrical distribution; sewage systems; five BEQs, three BOQs, public works facilities, administrative, and other support facilities.

Diego Garcia today encompasses a very busy support facility with a communications station, a naval air facility, a major fuel storage facility, a permanent pier, and other support structures. Naval Support Facility, Diego Garcia, hosts over 15 tenant activities, including a weather service unit, a Navy broadcasting unit and fleet air reconnaissance and patrol squadrons. The runway at Diego Garcia has been lengthened from 8,000 feet to 12,000 feet. The extension permits operation of larger cargo aircraft as well as high-performance, tactical aircraft under a variety of circumstances in the tropical climate. Other airfield improvements include additional parking aprons and arresting gear for emergency use and limited aircraft maintenance facilities.

Rear Admiral William M. Zobel, Chief of Civil Engineers and Commander, Naval Facilities Engineering Command, recently praised the SEABEE efforts on Diego Garcia and said, "With the departure of NMCB 62 from Diego Garcia on July 14, 1982, we closed another illustrious chapter in our SEABEE history."

UNITS OF THE NAVAL CONSTRUCTION FORCE

The NCF consists of commissioned units of the Navy operating forces that are under the

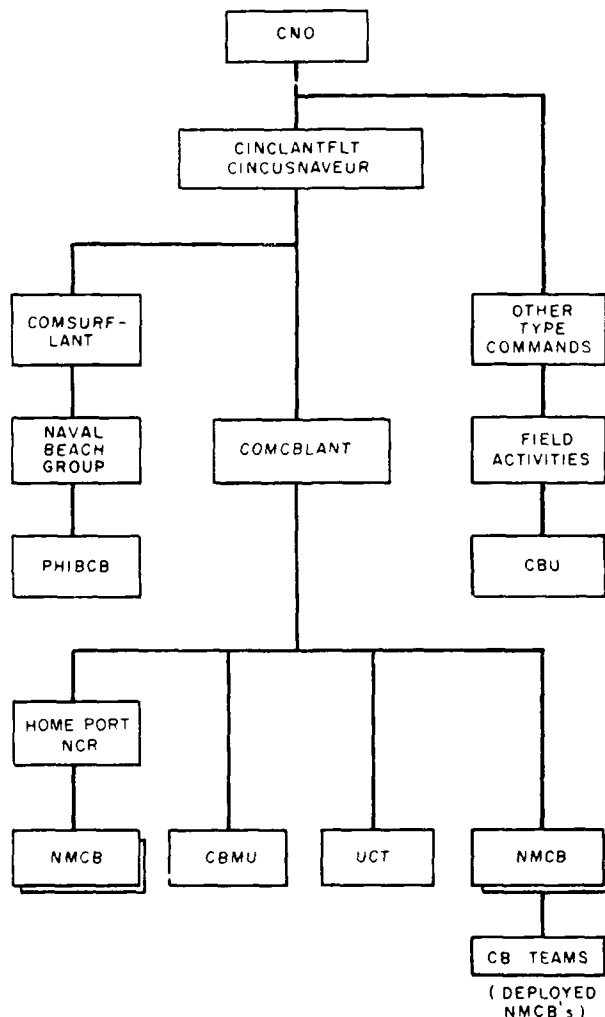
Chapter 1—HISTORY AND ORGANIZATION OF THE SEABEES

control of the Chief of Naval Operations (CNO) as shown in figures 1-2 and 1-3. The CNO commissions naval construction force units, assigns them to the fleet, and approves their deployment. He also defines the general mission, approves personnel allowance lists, and establishes detachment sites, approves the NMCB Table Organization Allowance (TOA) except for small arms, weapons, and landing party equipment allowances, which are approved by the Chief of Naval Material.

The Commanders in Chief of the Atlantic and Pacific Fleets are charged with ensuring that

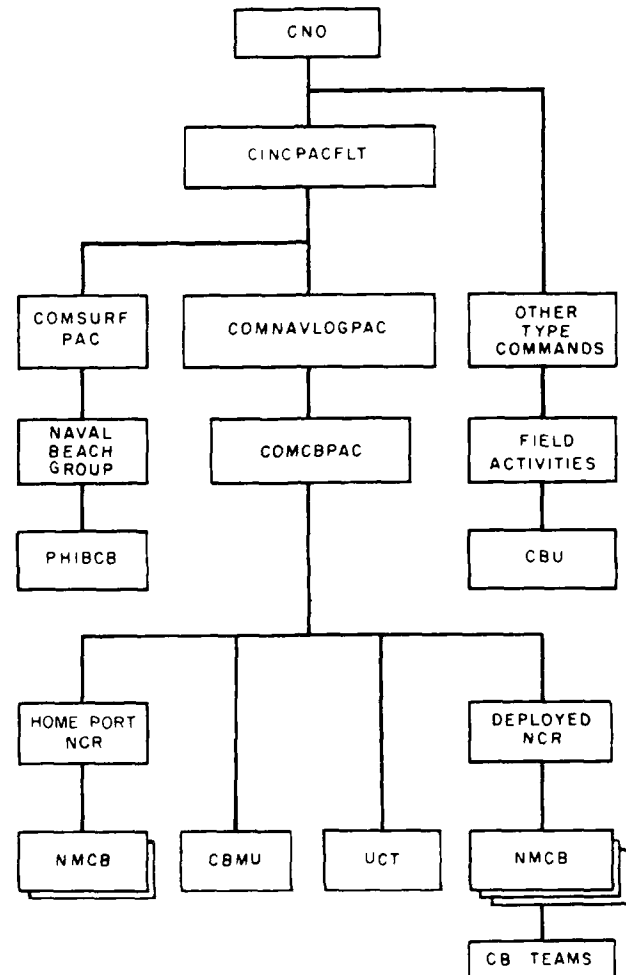
NMCB employments and assigned projects follow CNO policies. They exercise command or operational and administrative control of the units of the NCF assigned to their command. Command or operational control is the authority to assign tasks, to designate objectives, to give any specific directions necessary to accomplish the mission, and by a specified date, when required. Command control and operational control go together; if you have one, you automatically have the other.

Under the Commanders in Chief of the Fleets, various type commanders command all the ships or units of a certain type. For example, all surface



187.105

Figure 1-2.—Chain of command for LANTFLT NCF units.



187.106

Figure 1-3.—Chain of command for PACFLT NCF units.

units of the Pacific Fleet (COMNAVSURFPAC); the commander of the submarine forces in the Atlantic Fleet is COMSUBLANT.

Commander, Construction Battalions, Atlantic (COMCBLANT) (Norfolk) and Commander, Construction Battalions, Pacific (COMCBPAC) (Pearl Harbor) have been established as representatives of the Commander in Chief, U.S. Atlantic Fleet and the Commander in Chief, U.S. Pacific Fleet respectively to exercise command and administrative control over assigned NMCBs. Much of this control is exercised through the home port naval construction regiment (NCR). The home port NCR performs the routine functions related to coordination of administration, training, project selection, and logistic support for assigned units. Logistic support by the home port NCR consists of planning and carrying out the movement of personnel and equipment, furnishing of services, supplies, and materials.

When a battalion is deployed overseas, it is under the command and control of a separate naval construction force (NCF) commander. Operational command of the NMCB will be exercised, in all cases, through a designated NCF commander.

The Chief of Naval Operations may establish naval construction regiments (NCRs) and brigades (NCBs) to meet certain command requirements in particular geographic areas or situations. Operational regiments consists of two or more NMCBs under one commander; a brigade is made up of two or more regiments under one commander. The mission of the operational brigades and regiments is different from the mission of the home port regiments. Operational regiments and brigades are primary planning groups and exist as subdivisions of the military command, exercising the administrative and operational control to meet specific operational requirements. The home port regiments have broad administrative and logistic duties that are discussed in this chapter.

CONSTRUCTION BATTALION UNIT (CBU)

The CBU is a shore-based unit established by the CNO, outfitted and trained to operate as a military unit in the construction effort. It has the

capabilities, during a period of an emergency or disaster, to construct essential facilities for shelter and health of personnel and for the protection of property. The unit is not self-sustaining because another activity (the host activity) provides berthing, messing, disbursing, and accounting functions.

Today's CBUs are used mainly for the Self-Help Program for Navy personnel. These units spearhead welfare, recreation, and morale construction projects to improve living ashore for Navy personnel.

CONSTRUCTION BATTALION MAINTENANCE UNIT (CBMU)

The CBMU operates, maintains, and repairs public works and utilities at an already established advance base or at a recently constructed base after the departure of the NMCB or NMCBs that built it. In addition, the CBMU maintains security against unfriendly acts and is capable of conducting its own defenses. The CBMU also provides limited construction support for the base, for civic action programs, and self-help projects. It also participates in disaster recovery operations.

Functions usually performed by a CBMU are maintenance, repair, and minor construction of buildings and grounds, existing roads within the base, and waterfront and airfield facilities. The CBMU operates and maintains automotive, construction, weight-handling, and materials-handling equipment, except for equipment assigned to combat units.

AMPHIBIOUS CONSTRUCTION BATTALIONS (PHIBCBS)

The PHIBCBs are commissioned naval units whose main function is to provide military and amphibious construction support to the Armed Forces in military operations. In addition to providing the means for moving troops and equipment from ship to shore, the PHIBCB may—

1. install and operate tanker-to-shore bulk fuel delivery systems;
2. develop and improve beach facilities;
3. undertake special construction projects, especially those requiring surf, open sea, and heavy rigging experience, including work with pontoons and other floating equipment.

In some instances, there may be Underwater Demolition Team (UDT) personnel working to remove underwater obstacles that may jeopardize landing operations.

The PHIBCB is organized administratively into a headquarters company, an equipment company, two waterfront companies, and a single construction company. The size and composition of a PHIBCB is based on providing support for landing a reinforced infantry division over four battalion-sized beaches normally considered to be 4,400 meters wide. The PHIBCB is not intended for prolonged use in the field and is finished when the mission of the naval beach group is accomplished. This group assists the landing force in ship-to-shore movement by providing a uniform flow of material and services required by the landing force. To carry out this task, the PHIBCB provides causeway piers, barge units, fuel systems, and construction in support of the landing party.

At present there are two PHIBCBs: Amphibious Construction Battalion ONE operating from Coronado, California, and Amphibious Construction Battalion TWO, operating from Little Creek, Virginia.

UNDERWATER CONSTRUCTION TEAMS (UCTs)

The UCTs are specially trained units that construct, maintain, and repair underwater facilities. Each UCT is capable of performing underwater construction tasks and surveying the sea bottom to select the site for an underwater facility.

The two UCTs are assigned to the 31st NCR and COMCBLANT, home ported at Naval Construction Battalion Center (NCBC), Port Hueneme, California, and Naval Amphibious Base, Little Creek, Virginia, respectively.

SEABEE TEAM (CIVIC ACTION TEAM)

A SEABEE team is a small, highly mobile, air transportable construction unit that can be tailored to accomplish a variety of construction tasks. The standard composition of a SEABEE team is one CEC officer and 12 petty officers; however, when necessary, the standard personnel allowance can be increased to allow the undertaking of a specific deployment task.

Although SEABEE team allowances are normally associated with an NMCB, the responsibility for the team's operation in a foreign country lies with the appropriate U.S. and host country agencies.

The tasks usually assigned to a team call for experience in operating equipment needed for the following tasks:

1. Constructing roads, dams, and bridges
2. Clearing forests and jungles to reclaim land for new hamlets, croplands, and refugee centers
3. Drilling water wells
4. Digging irrigation canals
5. Building schools, and erecting, repairing, and improving public buildings

Teams carry enough food, tool kits, and automotive and construction equipment to be self-sufficient in the field while performing their construction tasks. SEABEE teams also provide medical and dental care to the local villagers and conduct on-the-job training and classroom instruction for host country workmen.

These teams receive extensive training at their parent NMCBs' home port. After completion of this training, they may be deployed to any part of the world—generally to an underdeveloped area. These teams are actually the SEABEES' "Peace Corps," and their work in Vietnam won the admiration of the Vietnamese. SEABEE teams have also been deployed as engineers for the Army's Special Forces, technical instructors for the Agency for International Development, and construction advisors under various military assistance programs.

ORGANIZATIONS SUPPORTING THE NCF

Many elements of the national defense organization provide support to the NCF, some directly and some indirectly. In this section we will cover only the Naval Facilities Engineering Command (NAVFAC), NCBCs, and home port naval construction regiments (NCRs).

NAVFAC

NAVFAC provides support for the NCF in the general area of shore facilities and related material and equipment. The commander of NAVFAC

serves as technical advisor to the CNO on all matters relating to the NCF, and also as technical advisor to the Chief of Naval Personnel (CNP) on all matters pertaining to CEC officer and SEABEE personnel.

NAVAL CONSTRUCTION BATTALION CENTERS (NCBCs)

NCBCs are permanent shore stations equipped and staffed to support the NCF. Each NCBC has a supply and fiscal department and a construction equipment department (CED) that furnishes depot level maintenance for units of automotive and construction equipment. This type of maintenance involves major overhaul, using facilities that are not readily available at the battalion level. Naval Construction Training Centers (NCTCs) are tenant commands at the NCBC and provide schools training to NMCB personnel. A tenant command is one that occupies buildings and uses facilities provided as direct support by the NCBC. The NCBC receives, preserves, stores, accounts for, and issues advanced base material and equipment. Newly commissioned NMCBs are usually outfitted at the NCBC, which also provides home port facilities. The NCBC is under the management and technical control of NAVFAC. At present there are two NCBCs, one at Port Hueneme, California, and one at Gulfport, Mississippi.

HOME PORT NAVAL CONSTRUCTION REGIMENTS (NCRs)

Home port NCRs are located at both of the NCBCs. Under the direction of COMCBPAC/COMCBLANT, the home port NCR's mission is to ensure maximum effectiveness of all units of the NCR, while at home port, in achieving the highest possible state of readiness to meet their disaster recovery, contingency, and wartime missions of military construction support of the Armed Forces. As a secondary mission, the home port NCR acts as a receiving and separating activity for SEABEE personnel.

The home port NCRs exercise operational control and, as specifically designated by COMCBPAC/COMCBLANT, various elements of administrative control over all units of the NCF at the home port. The home port NCRs—

- conduct and coordinate military, technical and specialized training;
- administer the details of the automotive and equipment program;
- provide liaison with NCBC on storage, preservation, and shipping of advanced base and mobilization stocks;
- provide management guidance and evaluate the effectiveness of military, operational, and material readiness of all homeported units of the NCFs;

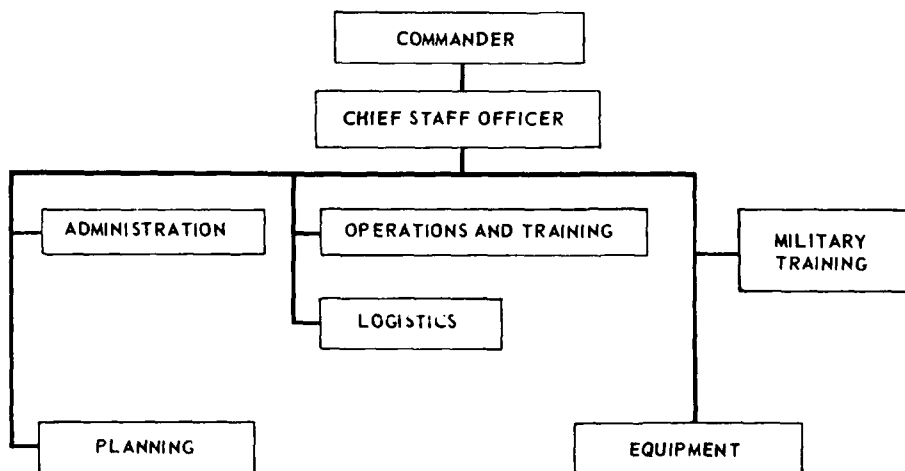


Figure 1-4.—Staff/function home port naval construction regiment.

- monitor personnel distribution among the NCF units;
- make recommendations to the Enlisted Personnel Distribution Office.

The basic organization and functions of a typical home port NCF's staff are shown in figure 1-4.

NAVAL CONSTRUCTION FORCE SUPPORT UNIT (NCFSU)

The Naval Construction Force Support Unit (NCFSU) provides logistical support for an NCF and other supported NCF units. NCFSU equipment is maintained both in the active force and in the Reserve (PWRMS). The NCFSU—

- performs inventory management of construction materials including requisitioning, expediting, receipt, control, issue, delivery, and other supply support functions;
- maintains inventory control;
- operates and performs maintenance, repair, and upkeep of NCF auxiliary construction and transportation equipment;

- performs specialized repair and overhaul of equipment components (such as transmissions, electric motors, and fuel injectors) when conditions warrant a centralized operation;

- provides the operation and maintenance capability for plants, such as rock crushers and asphalt and concrete batch plants, large paving machines, long-haul transportation, and other equipment of this type.

NAVAL MOBILE CONSTRUCTION BATTALIONS

The NMCBs are primarily designed for construction and military support operations to build advance base facilities in support of the Armed Forces. Figure 1-5 shows the basic NMCB organization. The NMCBs' function also includes projects of repair and operation of facilities and lines of communications during emergencies or under conditions that demand immediate action. When fully outfitted, NMCBs are self-sufficient units for 90 days and require replenishment of consumable items only. They can defend

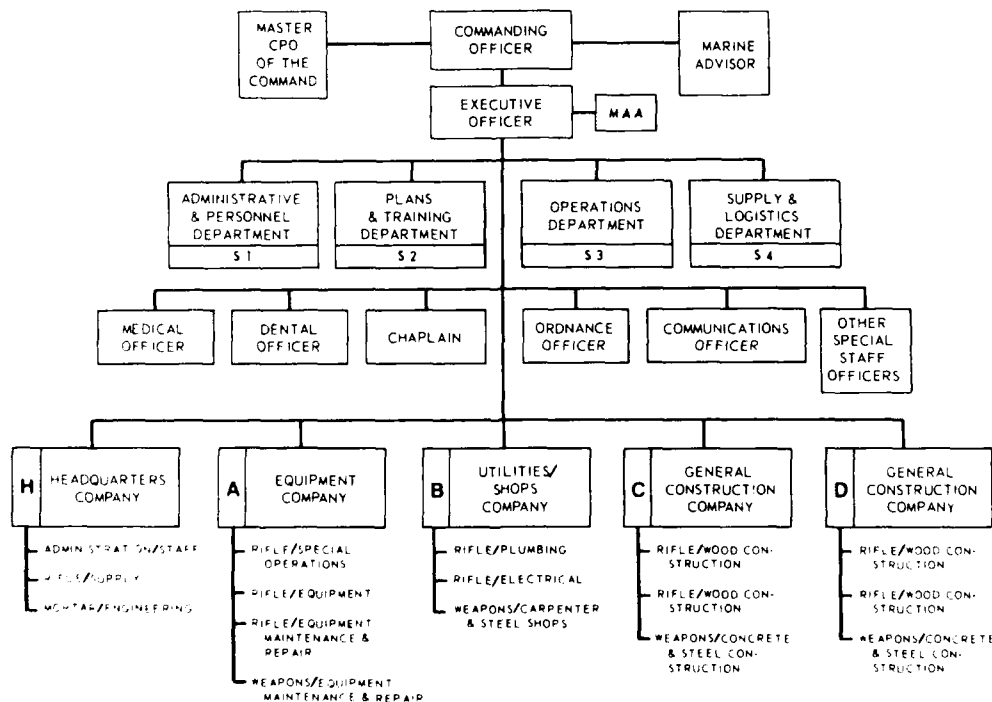


Figure 1-5.—The basic NMCB organization.

themselves for a limited time; communicate internally; provide messing and billeting facilities; and perform the necessary administrative, personnel, medical, dental supply, and chaplain functions. The NMCBs also participate in disaster recovery operations during both natural and man-made disasters.

Each battalion subdivision has a construction and military support assignment and every officer and enlisted man fills a construction and military billet. Command channels are the same for both construction and military support, permitting rapid transition from one to the other.

The battalion is organized into one headquarters and four construction/rifle companies: A, B, C, and D as shown in figure 1-6.

The construction/rifle companies each have a weapons platoon containing M60 machine guns and lightweight antitank weapons.

The headquarters company has a weapons platoon containing the 81-mm mortars. (See fig. 1-7.) All platoons are organized into work squads that correspond to the weapons/rifle squad organization. Work crews and work squads of construction platoons are also trained as disaster control teams. Each battalion may organize the squads of each platoon to meet its particular needs. The construction/military companies retain their normal letter designation and the platoons retain their letter-number designation to facilitate reference, planning, and scheduling.

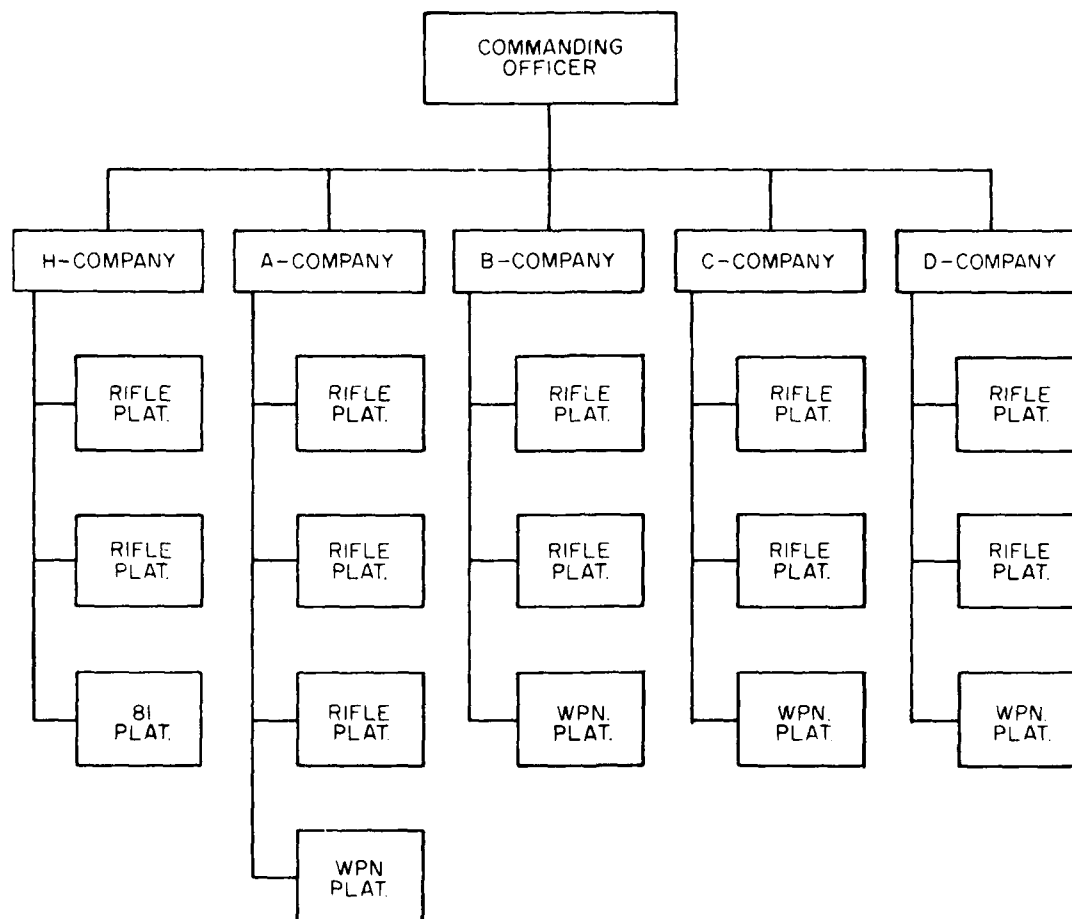
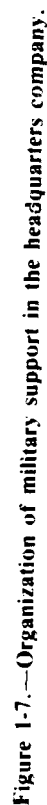


Figure 1-6.—The NMCB military organization.



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HEADQUARTERS COMPANY

The headquarters company of a SEABEE battalion serves as the military and administrative organization for the personnel assigned to the executive and special staffs of the NMCB. Headquarters company has the capability of providing defense in a combat situation as a company unit and, in addition, acts as a reserve force for the battalion. The headquarters company's staff, when participating in a defensive situation, consists of the company commander, platoon commanders, a company chief petty officer, and other administrative assistants as required to organize it into two rifle platoons and one weapons (mortar) platoon, as shown in figure 1-7.

Headquarters Company Commander

Normally assigned to additional duty on the battalion staff, the headquarters company commander is responsible for the following:

1. Command of the company in all military formations and operations
2. Assignment of personnel on the watch, quarter, and station bill
3. Personnel muster
4. Supervision and coordination of military and leadership training
5. Administration and guidance in professional and technical training
6. Berthing, messing, mail distribution, and physical fitness
7. Division officer responsibilities, unless separate division officers are assigned

He is also responsible for the security and defense of the battalion's command post and acts as the reserve force commander for the battalion in the defense. He is armed with the .45-caliber pistol.

Platoon Commanders

All personnel assigned to the battalion's executive and special staffs are administratively assigned to headquarters company. Therefore, the headquarters platoon commanders would normally be officers of the administration and

personnel department, the operations department, and the supply and logistics department. However, most battalions generally utilize a chief petty officer (E-7) from each department to act in the capacity of platoon commander.

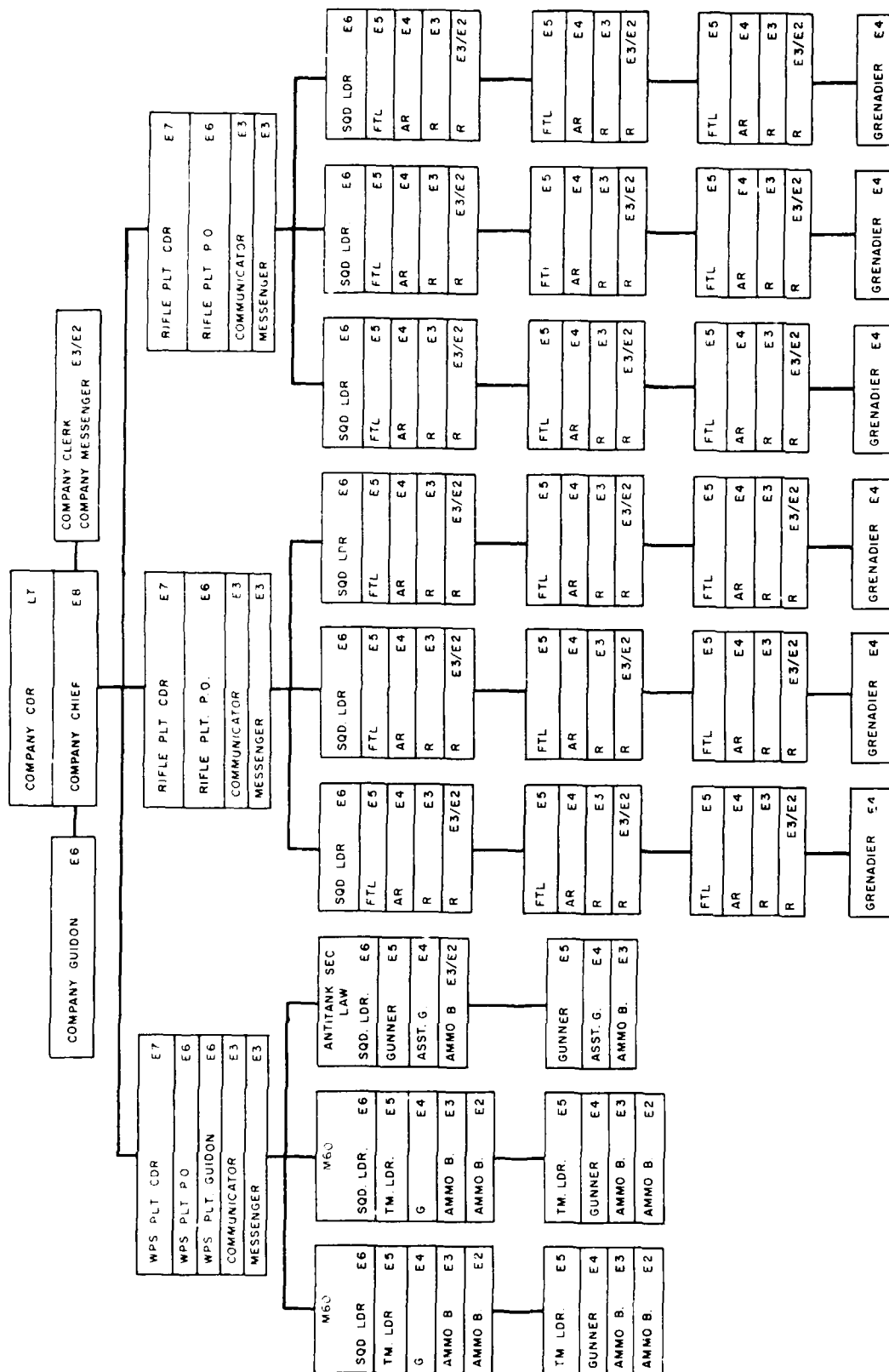
The platoon commander is responsible for training, discipline, control, and tactical deployment of his platoon. He carries out the orders of the company commander and controls his platoon through his squad leaders. In combat, the platoon commander positions himself where he can readily control his squad leaders. At the same time, he remains in contact with his company commander. He is generally linked with the company commander by radio and field telephone or both, and is armed with the service pistol.

Headquarters Company Chief Petty Officer

The headquarters company chief petty officer can be a chief petty officer (E-7) or a senior chief petty officer (E-8), and serves as an assistant to the headquarters company commander in a staff capacity. The headquarters company CPO is directly responsible to the company commander for the administration and efficient operation of the company. He is also responsible for the discipline, training, and performance of the men assigned to the company and is armed with the service pistol.

THE RIFLE COMPANY HEADQUARTERS

The company headquarters of a SEABEE company consists of the company commander, an assistant company commander when assigned, the company chief, a company guidon, a company clerk, a company messenger, and other administrative assistants as required. The company headquarters varies somewhat in each company, depending on its construction/combat missions. Figure 1-8 shows the organization of military support in the construction/rifle companies.



187.109

Figure 1-8.—Organization of military support in the construction rifle companies.

Rifle Company Commander

The rifle company commander is usually a lieutenant in the Civil Engineer Corps who is responsible for commanding his company by following the policies of the commanding officer. In general, he performs the following functions:

1. Exercises command through his company senior chief and platoon commanders
2. Organizes and trains his company for construction (or construction support), for combat, and for disaster recovery operations
3. Executes efficiently all work assigned to his company by proper authority
4. Maintains his company in a state of readiness to redeploy rapidly to meet emergency situations
5. Looks out for the morale and welfare of men assigned to him

He is armed with the service pistol.

Assistant Rifle Company Commander

The assistant company commander, when assigned, may be a junior CEC officer or a senior enlisted man. He is normally placed in a position of line authority and responsibility between the company commander and the platoon commanders. As a personnel and material manager within the company, he concerns himself with executing and enforcing the policies of the company commander and the commanding officer. The assistant company commander supervises the administration of the company; plans and gives technical support to the platoon commanders about their crew assignments, project planning and scheduling, safety, and training. He is armed with the service pistol.

Rifle Company Chief

The company chief is the senior enlisted man assigned to the company, usually, a senior chief petty officer (E-8) or a master chief petty officer (E-9). He is the primary administrative assistant and technical advisor to the company commander. The company chief is directly responsible to the company commander for the administration and efficient operation of the company and for the

discipline, training, and the performance of the men assigned to the company. He is armed with the service pistol.

Rifle Company Guidon

The company guidon, generally a petty officer first class (E-6), acts as a construction expeditor and supply coordinator for the company. During combat, he is stationed near the company commander and is responsible for the distribution of ammunition to the platoon guides. He coordinates the ammunition counts following combat to ensure appropriate redistribution. He is armed with the service pistol.

Rifle Company Clerk

The company clerk is normally a constructionman (E-3) with clerical experience. His duties consist of preparing company memorandums, typing, filing, and many other administrative tasks. He is also the company mail orderly. During military operations, he becomes the company staff communicator and must be familiar with the operation and care of the company communication equipment. In addition, he is trained in proper procedures for transmitting reports and messages. The company clerk also may serve as guidon (company banner) bearer during parade formation. He is armed with the M16 service rifle.

Rifle Company Messenger

Generally, a Constructionman (E-3) is assigned to the company headquarters as a company messenger. He primarily performs in this capacity only during military operations. For work purposes, he is assigned to a work crew/rifle fire team. Although he delivers most of his messages on foot, he is also trained in the operation of communications equipment so he can take over should the company clerk become a casualty. When the company administrative tasks increase, as they do during home port training periods, the messenger may assist the company clerk with his duties. He is armed with the service rifle.

RIFLE PLATOON HEADQUARTERS

The maneuvering elements of a rifle company are the rifle platoons. A SEABEE rifle platoon consists of a platoon headquarters and three or more rifle squads. Each rifle squad is composed of three or more work crew/rifle fire teams. The primary combat mission of the rifle company as well as the rifle platoon is to repel the enemy assault by fire and close combat.

Each rifle platoon headquarters consists of a platoon commander, platoon petty officer, platoon guide, communicator, and a messenger.

Rifle Platoon Commander

The rifle platoon commander is generally a chief petty officer (E-7). Normally, he is the project supervisor. He is responsible for the training, discipline, control, and tactical deployment of his platoon. The rifle platoon commander carries out the orders of the company commander and controls his platoon through his squad leaders. In combat, the platoon commander positions himself where he can readily control his squad leaders and, at the same time, remain in contact with his company commander. The platoon commander is generally linked with the company commander by either radio or field telephone or both. He is armed with the service pistol.

Platoon Petty Officer

The platoon petty officer, generally a first class petty officer (E-6), is the next senior man in the platoon and is second in command. As such, he performs all duties assigned by the platoon commander and stands ready to assume command in his absence. On the job, he will assist in project supervision. In combat, he assists in all aspects of supervision and control of the platoon. The platoon petty officer positions himself where he can hear the commands of the platoon commander but far enough away to avoid becoming a casualty should the platoon commander be hit. The platoon petty officer is also armed with the service pistol.

Platoon Guide

The platoon guide is generally a first class petty officer (E-6) who performs the administrative functions the platoon commander may direct. He is directly responsible to the platoon commander for the supply and timely resupply of the platoon in combat and often performs a similar task on the jobsite. He also maintains the platoon casualty record. While the platoon is moving in training or in combat operations, the platoon guide helps prevent straggling. He is armed with the service rifle.

Platoon Communicator and Messenger

These men are generally constructionmen (E-3); and during normal construction, they are assigned to work crew/rifle fire team. The platoon communicator and messenger, in combat, provide communications between the rifle company headquarters and the rifle platoon commander and also between the rifle platoon, its squads, and attached units. The communicator uses radio or telephone communication methods, while the messenger generally travels on foot. Both are armed with service rifles.

THE RIFLE SQUAD

The SEABEE rifle squad is composed of a squad leader, three fire teams and a grenadier. Ideally, the rifle squad will contain three fire teams of four men each, a grenadier and the squad leader for a total of 14 men.

Squad Leader

The squad leader is generally a first class petty officer (E-6). He carries out the orders of the platoon commander and is responsible to him for the discipline, appearance, training, control, and conduct of his squad at all times. He must pay particular attention to the care and maintenance of the squad's weapons and equipment. In combat, he has the important responsibilities of fire discipline, fire control, and maneuvering his squad. He takes a position where he can best observe and control his squad and carry out the orders of the platoon commander. He controls his squad by voice and visual commands. The

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squad leader is primarily a leader; therefore, he only fires his own weapon in critical situations. He is armed with the service rifle.

Grenadier

The grenadier, generally a third class petty officer (E-4), carries out the orders of the squad leader and is responsible to him for the effective care, maintenance, and employment of his weapon, the M203 grenade launcher. In combat, the grenadier always moves with or is close to the squad leader. Usually, another E-4 in the squad is trained to replace the grenadier should he become a casualty. On the jobsite, the grenadier has no special authority unless specifically designated.

THE RIFLE FIRE TEAM

The rifle fire team is the basic combat unit of the rifle squad and is formed around the automatic rifle, which is an M16 service rifle, with the selector lever always turned to full automatic. The fire team normally consists of four men, although it may contain as few as three and as many as seven men. All members are armed with the M16 service rifle. The four basic members are the following:

1. Fire team leader
2. Automatic rifleman
3. Rifleman number 1
4. Rifleman number 2

Fire Team Leader

The fire team leader, generally a second class petty officer (E-5), carries out the orders of his squad leader and is responsible to him for the effective employment of his fire team. His primary responsibility is to control his fire team in combat. In addition, he is responsible for the care and condition of the fire team's weapons and equipment. The fire team leader stations himself where he can best control the fire of the team's automatic rifles. He usually controls his men through real and visual communications, since there are normally no radio or telephone communications below the platoon commander's level. Although he is armed with the service rifle,

his primary duty as a leader comes first; and he serves as a rifleman only when absolutely necessary. The senior fire team leader serves as assistant squad leader and is prepared to take over the squad in the event that the squad leader becomes a casualty.

Automatic Rifleman

The automatic rifleman, generally a third class petty officer (E-4), provides heavy firepower and is the backbone of the fire team. He is responsible to the fire team leader for the effective employment of his automatic rifle as well as its condition and care. The automatic rifleman acts as the fire team leader's assistant and takes over in his absence.

Rifleman Number 1

Rifleman number 1, generally a constructionman (E-3), carries extra ammunition for the automatic rifleman. The automatic rifle must be kept in action at all times; if the automatic rifleman becomes a casualty, rifleman number 1 moves up and replaces him. In addition, rifleman number 1 is armed with the service rifle and acts as a rifleman and a scout. He assists rifleman number 2 in protecting the flank (exposed side) of the fire team.

Rifleman Number 2

Rifleman number 2, a constructionman (E-3) or an apprentice (E-2), serves as a rifleman and protects the flank of the fire team. He is point man for all team formations and may also serve as a scout. If more than four men are assigned to the fire team, the additional men have the same general duties as rifleman number 2. All are armed with the service rifle.

FIRE SUPPORT ELEMENTS

The fire support elements of the rifle companies are the weapons platoons, the 81-mm mortar platoon of the headquarters company, and the weapons platoons furnished by the construction/rifle companies. Their purpose is to provide the companies organic machine gun and mortar fire support and an antitank defense with the light antitank weapon (LAW).

THE WEAPONS PLATOONS

ALFA, BRAVO, CHARLIE, and DELTA Companies each have a weapons platoon composed of a platoon headquarters, two machine gun squads, and an antitank squad.

WEAPONS PLATOON HEADQUARTERS

The weapons platoon headquarters consist of the platoon commander, platoon petty officer, ammunition technician/guide, a communicator and a messenger.

Weapons Platoon Commander

The weapons platoon commander is generally a chief petty officer (E-7). He is responsible for the training, combat efficiency, discipline, administration, and welfare of his platoon. He also sees to it that his platoon members proceed correctly when carrying out preventive maintenance on their weapons. The weapons platoon commander makes sure they use their weapons and equipment economically. All of his other responsibilities are similar to those discussed for the rifle platoon commander. He is armed with the service pistol.

Weapons Platoon Petty Officer

The weapons platoon petty officer is usually a first class petty officer (E-6). His responsibilities and duties are identical to those of the rifle platoon petty officer. He is armed with the service pistol.

Ammunition Technician/Guide

The ammunition technician/guide is also a first class petty officer (E-6). He not only has the responsibility of supplying the platoon and keeping the casualty list, but he also must be highly skilled in the operation and maintenance of the machine guns used by his platoon. He must be familiar with the many types of ammunition used by the machine guns, its safe use, and its effect upon the enemy. The ammunition technician/guide's other duties are similar to those of the rifle platoon guide. He is armed with the service rifle.

Communicator and Messenger

The communicator and the messenger, both usually constructionmen (E-3), perform the same basic duties as their counterparts in the rifle platoon. They are armed with the service rifle.

MACHINE GUN SQUAD

The machine gun squad consists of a machine gun squad leader and two four-man machine gun teams. They work together under the supervision of the crew/squad leader.

Machine Gun Squad Leader

The machine gun squad leader, generally a first class petty officer (E-6), has the same basic duties as the rifle squad leader. In addition, he selects and assigns exact positions and targets for his machine guns within the area designated by his platoon commander. The machine gun squad leader is armed with the service rifle and also carries binoculars and a compass.

The Machine Gun Team

The machine gun team consists of a team leader, a gunner, and two ammunition carriers. This team operates and services the machine gun.

Machine Gun Team Leader

The machine gun team leader, generally a second class petty officer (E-5), is responsible to the squad leader for the effective employment (fire power) of his team's machine gun. He carries and places the machine gun tripod for action. He also carries one bandolier (belt with pockets to carry machine gun ammunition). During combat, the machine gun team leader is responsible for changing the machine gun barrel; so he carries a kit that contains an extra gun barrel and a combination wrench. He is armed with a service pistol.

Gunner

The gunner does the actual firing of the machine gun in combat as directed by the team

leader. He carries the machine gun, one bandolier of machine gun ammunition, and is armed with a service pistol. Also, he must be able to maintain his machine gun. Generally, the gunner is a third class petty officer (E-4).

Ammunition Carrier Number One

The ammunition carrier number one, generally a constructionman (E-3), acts as the supply man for the team. He carries one box of machine gun ammunition (200 rounds) and the spare barrel case with the traversing and elevating (T & E) mechanism. Ammunition carrier number one is armed with the service rifle. When not actually engaged in carrying machine gun ammunition, he protects the flank of the machine gun team.

Ammunition Carrier Number Two

Ammunition carrier number two, generally a construction apprentice (E-2), carries two boxes of machine gun ammunition (400 rounds). He is armed with the service rifle and also protects the machine gun team.

THE ANTITANK (LAW) SQUAD

The antitank squad consists of two three-man teams whose principle mission is defense against armored vehicles (tanks).

Antitank Squad Leader

The antitank squad leader, generally a first class petty officer (E-6), has the same basic duties as any other squad leader. In addition, he selects and assigns the exact positions and targets for his antitank weapons within the areas defined by his platoon commander. He is armed with the service rifle, and he carries binoculars and a compass.

The Antitank Team

The antitank team consists of three men carrying five LAWs each. These men are also armed with service rifles.

THE 81-MM MORTAR PLATOON

The NMCBs 81-mm mortar platoons can provide fire support during an assault or during defense. It is extremely effective in defending an established camp site against attacking ground forces and is often used to provide illumination during night operations. Since the mortar is a relatively heavy weapon, it is not often carried about during normal work operations. Permanent positions are generally set up in the base camp area near the battalion administrative area. As the major portion of the headquarters company personnel remain in camp during normal working hours, they are always available to man the mortars. This is the reason that the mortar platoon is normally assigned to headquarters company.

The standard mortar platoon consists of a platoon headquarters and four mortar squads of two crews each. However, the NMCBs at present are only authorized six 81-mm mortars in the weapons allowance. Therefore, the present NMCBs mortar platoons have three squads of two crews apiece.

MORTAR PLATOON HEADQUARTERS

The mortar platoon headquarters consists of the platoon commander, assistant platoon commander, ammunition technician, and a minimum of two communicators.

Mortar Platoon Commander

The mortar platoon commander may be either a junior officer or a chief petty officer (E-7), preferably from the engineering department. He has the same general duties as any other platoon commander. However, during actual combat operations, he takes up a position in the fire direction center (FDC). The FDC can be a separate bunker, generally located in the battalion command post. In the FDC, he receives fire missions from his forward observers (FOs) or from other commands. He then plots the targets on the plotting board to check their accuracy and determines the exact coordinates. After receiving permission to fire from the commander officer, he issues fire commands to his squad leaders. The platoon commander is armed with the service pistol.

Assistant Mortar Platoon Commander

The assistant mortar platoon commander, normally a first class petty officer (E-6), must always be prepared to assume command of the platoon. During combat, he takes up a position in the alternate command post and stands ready to take command of the platoon should the battalion command post be destroyed. He is armed with the service pistol.

Mortar Platoon Ammunition Technician

The mortar platoon ammunition technician, usually a first class petty officer (E-6), has the same responsibilities of supply, weapons maintenance, and casualty reporting as the weapons platoon ammunition technician. He is armed with the service rifle.

Mortar Platoon Communicators

The mortar platoon communicators, generally constructionmen (E-3), are trained as a team and must be completely familiar with fire commands and procedures. Whenever possible, one communicator is stationed with each forward observer. He passes target information back to another communicator in the FDC by radio. After the fire missions are assigned by the platoon commander, the FDC communicator passes the proper fire commands to the respective squad leaders by field telephone. All communicators are armed with service rifles.

THE MORTAR SECTION

The mortar section consists of 11 men, a section leader, and 2 mortar crews of 4 men each, a forward observer, and a communicator.

Mortar Section Leader

The mortar section leader is usually a first class petty officer (E-6). He is responsible to the

platoon commander for the effective employment of his two gun crews. The section leader selects the exact position for placement of the mortar tubes. He supervises their placement and zeroing in. He is armed with the service rifle. The mortars are generally placed about 50 meters apart to help reduce casualties. The section leader normally takes up a position midway between and to the rear of the mortar positions. If possible, he is connected by telephone to his mortar gun crews and to the platoon commander in the FDC.

Forward Observer

The forward observer is usually a second class petty officer (E-5). He is normally the second senior man in the mortar squad. He is the eyes of the mortar team and has the primary mission of locating suitable targets, and calling for and adjusting fire on these targets. He is armed with the service rifle.

THE MORTAR GUN CREWS

Each mortar gun crew consists of four men. These men are called the crew leader/gunner, assistant gunner, ammunition carrier number one, and ammunition carrier number two.

Crew Leader/Gunner

The crew leader/gunner, usually a second class petty officer (E-5), is responsible for the correct sighting of the weapon. He receives the target coordinates from the squad leader and makes the necessary safety checks and adjustment to the weapon. He is armed with the service pistol.

Assistant Gunner

The assistant gunner, generally a third class petty officer (E-4), checks the mortar barrel for cleanliness, assists the gunner in positioning the barrel and loads the weapon on command. The weapon automatically fires upon loading. He is also armed with the service pistol.

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Ammunition Carrier Number One

Ammunition carrier number one, generally a constructionman (E-3), prepares the ammunition for firing and passes it to the assistant gunner. In addition, he realigns the aiming stakes under the direction of the gunner. He is armed with the service rifle.

Ammunition Carrier Number Two

Ammunition carrier number two, also a nonrated man (E-3 or E-2) assists in placing the mortar. He maintains the ammunition supply for the mortar and helps prepare the rounds for firing. He is also armed with the service rifle.

CHAPTER 2

SPECIAL CLOTHING AND EQUIPMENT

This chapter is intended as a guide for the individual SEABEE on the proper use and care of special clothing and equipment issued while serving with the Naval Construction Force.

The olive green utility uniform is known as special clothing. Special equipment is equipment needed by the individual under field conditions, whether in combat or in training. This special equipment is commonly called 782 gear, the number of the custody card originated in the Marine Corps Supply System years ago. This gear is also known as field or bivouac equipment.

General instructions for wearing, cleaning, pressing, storing, and mending items of the uniform are included in this chapter. Uses of the poncho, sleeping bag, and other bivouac equipment are discussed as well as methods of assembling, packing, and using load-carrying equipment. Instructions for the display of individual clothing and equipment are given where applicable.

You are responsible for the use and care of the clothing and equipment issued to you. It is your duty to see that these items are available and in a serviceable condition when they are needed. A torn sleeping bag cannot provide the protection required on cold nights, nor can your cold weather coat, if it does not have buttons or a zipper. Under certain circumstances, you may be charged for the replacement or repair of these items lost or damaged through carelessness. Under other circumstances, neglect may cost you your life.

SPECIAL CLOTHING (STANDARD ISSUE)

The initial allowance of olive green utility uniforms will be issued to you when you check into your unit. These items remain the property of the government; however, you are responsible for their proper upkeep. If an item wears out through normal use, it will be replaced at no cost by the unit's supply section. Always ensure that your clothing is in good shape before deploying to an overseas destination where the supply of these items may be limited.

Current instructions recommend that the standard MINIMUM OUTFIT issued to each man will consist of the following:

1. Six green shirts
2. Six pairs of trousers
3. Three caps
4. A cold weather coat (field jacket)
5. Two pairs of combination combat/safety boots

All items of clothing are to be marked in the following manner:

1. Green Shirts. When the green shirts are issued, a 1-inch wide green tape will be sewn above each pocket flush with the pocket seam. These tapes will be the full width of the pocket except that some men with long surnames may require tapes wider than the pocket. In addition, an iron-on type

SEABEE COMBAT HANDBOOK

of SEABEE insignia will be applied to the center of the left breast pocket (fig. 2-1).

The tape above your right breast pocket is stenciled with your last name in 3/4-inch block letters. Black stencil ink or black paint is used.

The tape above your left breast pocket is stenciled in the same manner with the words "U.S. NAVY" centered above the pocket. As an alternative to stenciling, block letters may be embroidered with black thread. The SEABEE insignia may also be embroidered on the pocket, but the sew-on patch is not authorized.

2. Trousers. A name tape similar to that sewn above your right breast pocket is to be sewn over the rear right pocket.

3. Caps. Utility caps should be stenciled with your initials only on the sweatband.

4. Boots. Each boot should be stenciled with your initials on the inside near the top.

5. Belt. The black web belt should be stenciled in white ink with your last name and initials on the end nearest the buckle.

6. Cold Weather Coat. This coat, commonly called a field jacket, is issued to you by the green issue supply office. The field jacket is to be stenciled in the same manner as the green shirt.

COLLAR DEVICES

SPREAD EAGLE AND CHEVRONS
WORN BY E-4 THROUGH E-6.

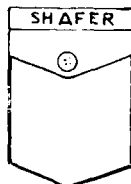


NAME TAPE

1" WIDE GREEN TAPE FLUSH WITH
TOP OF POCKET.

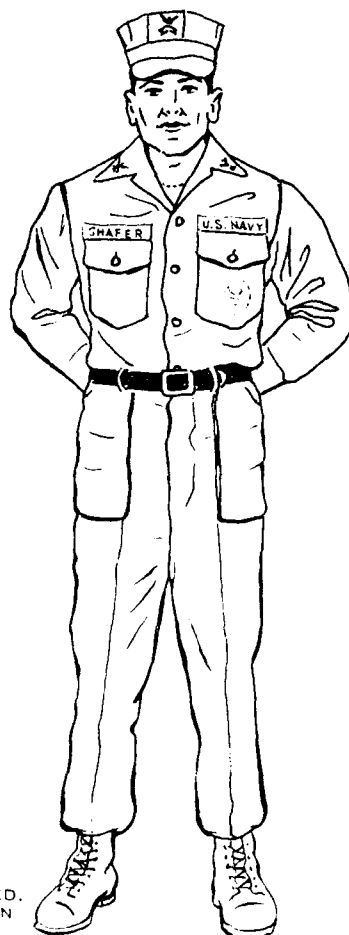
NAME

3/4" BLOCK LETTERS, STENCILED
IN BLACK INK OR EMBROIDERED
WITH BLACK THREAD, CENTERED
ABOVE POCKET.



BLOUSING

TROUSERS SHALL COVER TOP ROW
OF HOOKS OR EYELETS. BLOUSING
GARTERS OR SPRINGS SHALL BE USED,
RATHER THAN TUCKING TROUSERS IN
BOOT TOPS.



CAP

WORN SQUARELY ON HEAD. CAP
DEVICE SHALL BE WORN 1-1/4"
ABOVE THE VISOR.

U.S. NAVY TAPE

1" WIDE GREEN TAPE FLUSH
WITH TOP OF POCKET.

U.S. NAVY

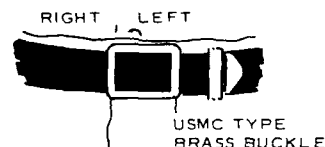
3/4" BLOCK LETTERS, STENCILED
IN BLACK INK OR EMBROIDERED
WITH BLACK THREAD, CENTERED
ABOVE POCKET.

SEABEE INSIGNIA

APPLIED TO LEFT BREAST POCKET:
IRON ON TYPE OR EMBROIDERED
WITH BLACK THREAD. IF EMBROI-
DERED INSIGNIA IS USED, NAMES
ON SHIRT OR TROUSERS MUST ALSO
BE EMBROIDERED.

BELT

RIGHT EDGE OF BUCKLE ALIGNED
WITH CENTER OF TROUSERS. TIP
END SHALL PASS THROUGH BUCKLE
RIGHT TO LEFT, AND SHALL EX-
TEND 2" TO 4" PAST LEFT EDGE OF
BUCKLE. BUCKLE AND TIP END
SHALL BE KEPT SHINED.



COMBAT OR COMBINATION COMBAT SAFETY BOOTS

APPEARANCE - SHINED OR OILED
AS PRESCRIBED BY APPROPRIATE
AUTHORITY.

Figure 2-1.—Olive green utility uniform.

Chapter 2—SPECIAL CLOTHING AND EQUIPMENT

All petty officers (E-4 to E-9) are required to wear cap and collar devices on the green utility uniform.

Cap devices are located 1 1/4 inches above the visor in the center of the cap. Chief through third class petty officers wear appropriate cap devices.

Chief petty officers wear the appropriate black CPO rank, collar devices centered 1 inch from each edge of the collar wings. Other petty officers wear a spread eagle and a series of black chevrons according to the individual's rate. These are worn 1 inch from the point of the collar wing along the axis of a line bisecting the angle of the collar point with the chevron's eagle facing inboard (fig. 2-1).

Nonrated personnel do not wear any type of collar or cap device.

The olive green uniform is worn as described below and as shown in figure 2-1. Clothing may be tailored slightly to ensure a proper fit, but formfitting tailoring, such as "pegging" or narrowing the trousers, is not permitted.

1. Cap. The cap is worn squarely on the head so that the visor is on line and just above the level of the eyes.

2. Green Shirt. The shirt is worn with the tail tucked in and all buttons, except the collar button, buttoned. Sleeves may not be rolled up, although the shirt may be removed while working when directed by proper authority. The sleeves of four of the six green shirts may be shortened to no less than 8 inches from the shoulder seam after hemming.

3. Trousers. The olive green utility trousers are worn with the rear edge of the trousers leg hemmed at 2 inches above the deck. When worn with the combination combat/safety boots, the trouser legs must be bloused with springs so that the blouse covers the top row of hooks or eyelets on the boot. The trouser legs are not to be tucked in the top of your boots in lieu of using blousing springs.

4. Footwear. The combination combat/safety boots will be worn with the utility uniform. They are black in color and must be kept clean and in good repair. They may be shined or oiled as prescribed by appropriate authority.

5. Belt. You must wear the standard Navy black belt with this uniform. However, only the Marine-type brass buckle is worn with the green utility uniform. The belt is worn with the right

edge of the buckle aligned with the center of the trousers, and with the brass-tipped end passing through the buckle to your left, approximately 2 to 4 inches (fig. 2-1).

6. Cold Weather Coat. When the coat (field jacket) is worn with the green utility uniform, all of the buttons except the top or collar button must be buttoned.

7. Changes in Regulation. Regulations concerning the wearing of the olive green uniform change from time to time. Changes are published in the NAVFACINST 1020.1 and are incorporated into the battalion or unit instructions. You should also review the corresponding section in United States Navy Uniform Regulations. All of these publications should be available in your unit's personnel office.

STANDARD ISSUE

The standard issue of 782 gear is divided into three categories: fighting load-carrying equipment, bivouac equipment, and protective equipment. Normally, this equipment is issued to you on a full-time basis whether you are in a combat area or in the United States for training.

The standard issue of 782 gear items is listed below:

1. Pistol belt
2. Field pack
3. Suspenders
4. Two ammo pouches
5. Canteen cover, canteen, and canteen cup
- *6. First aid packet
7. Entrenching tool and cover
8. Poncho
9. Shelter half with one tent pole, five tent pins, and guy line
10. Mess kit with knife, fork, and spoon
- *11. Bayonet or K-Bar
12. Helmet and liner
13. Camouflage cover
14. Hat and mosquito net

*These items may or may not be issued.

FIGHTING LOAD-CARRYING EQUIPMENT

Fighting load-carrying equipment consists of the items illustrated in figure 2-2 and described below. Each item has been designed to make the job of carrying the equipment you will need easier and more comfortable. There are certain rules, however, that must be followed if the equipment is to do the job for which it is intended. If the rules listed below are followed, individual loads can be carried with more ease and comfort.

Rules for carrying equipment:

- Keep your load as light as possible.
- Know your equipment.
- Assemble the equipment correctly.
- Keep every item in its proper place.

1. Pistol Belt (item 1 of fig. 2-2). The olive drab cotton-webbed pistol belt, M1956, has a special ball-type fastener which makes the belt easier to put on and take off. The belt uses eyelets for attachment purposes and has sliding keepers to prevent the belt hooks from becoming unfastened after adjustment to the wearer's waist. The pistol belt helps to carry the entrenching tool and carrier, the ammunition pouches, the canteen and cover, and the first aid or compass case. It is issued in two sizes, medium and large. Medium is the size for waist measurements under 30 inches; large is the size for waist measurements of 30 inches or more. The proper-sized belt can be adjusted to fit over all layers of outer clothing including the armored vest.

2. Ammunition Pouches (item 2 of fig. 2-2). Each small arms ammunition pouch is 4 1/4 inches wide, 6 1/4 inches high, and 2 1/2 inches deep. Plastic stiffeners are provided in the back of each pouch so that clips of ammunition can be easily inserted and removed. There are two attaching clips and supporting straps on the back of the pouch so that they can be fastened to the pistol belt and to the suspenders. (See fig. 2-5.) Both sides of each ammunition pouch have attachments for carrying hand grenades. The pouches are designed to carry any of the basic loads of ammunition; however, with special

weapons it may be necessary to carry more ammunition than the pouches will hold. When extra ammunition is needed, bandoleers of ammo may be carried in a cross-chest manner. To place bandoleers in pouches, make a neat bundle by folding the bandoleers accordion fashion and placing them in the pouches with the bandoleer strap on the top. This method permits the bandoleer to be inserted and removed easily.

3. Suspenders (item 3 of fig. 2-2). The olive drab, cotton-webbed suspenders, with the pistol belt, make up the basic individual fighting load-carrying equipment as the remaining components are suspended from them. The suspenders can be adjusted by means of the clamp-type buckles. Suspenders are issued in three sizes: regular, long, and extra long. If you are under 68 inches tall without shoes, wear the regular size. If over 68 inches, wear the large. If you are tall or broad chested, or intend wearing them over outer garments or the armored vest or both, wear the extra large. In any case, if you have the time, you should try them on first.

4. Entrenching Tool Carrier (item 4 of fig. 2-2). The entrenching tool carrier is made of olive drab, cotton duck material and is attached to the pistol belt by means of two attaching clips located on the back.

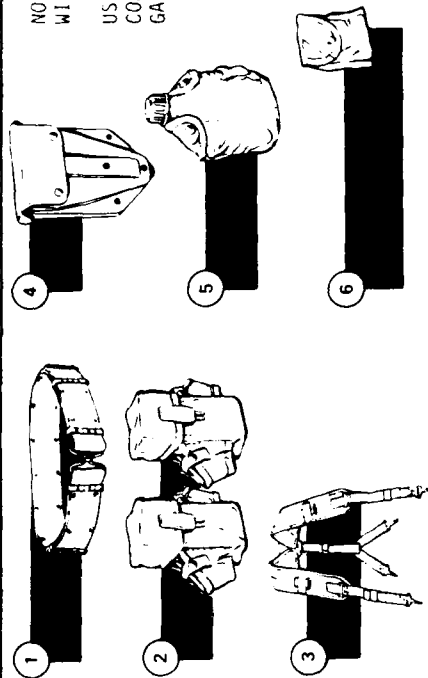
5. Canteen Cover (item 5 of fig. 2-2). The cotton duck canteen cover has either a pile or felt lining and is attached to the pistol belt by means of two attaching clips located on the back of the cover. The canteen cover accommodates the canteen and canteen cup. During warm weather, the lining should be kept wet to help keep your water cool. The cover should be kept dry during cold weather, as the lining provides some protection in preventing the water inside from freezing.

6. First Aid Case (item 6 of fig. 2-2). The cotton duck first aid case is attached to the pistol belt by means of a clip located on the back. The case is closed by means of a flap which is secured by a glove-type fastener. The first aid case is used either to carry a field dressing or an unmounted magnetic compass.

The method for assembling the individual fighting load-carrying equipment is described below in the sequence normally followed.

INDIVIDUAL FIGHTING LOAD CARRIERS

NOTE: MK17A1 GAS MASK COMES WITH A SPECIAL CANTEEN CAP. USE THIS CAP TO REPLACE CONVENTIONAL CAP WHEN USING GAS MASK.



- 1 1 EACH - PISTOL BELT, INDIVIDUAL EQUIPMENT, LARGE, 9D8465-00-001-6487
- 2 2 EACH - CASE, SMALL ARMS AMMUNITION (30-RD MAG) 9D8465-00-001-6482
- 3 1 EACH - SUSPENDERS, BELT, INDIVIDUAL EQUIPMENT 9D8465-00-001-6471
- 4 1 EACH - CARRIER, ENTRENCHING TOOL 9D8465-00-001-6474;
SHOVEL, D-HANDLE 5120-00-878-5932
- 5 1 EACH - COVER 9D8465-00-860-0256; CANTEEN 9D8465-00-889-3744;
CUP 9D8465-00-165-6838
- 6 1 EACH - CASE, FIELD FIRST AID DRESSING 9L6545-00-823-8165

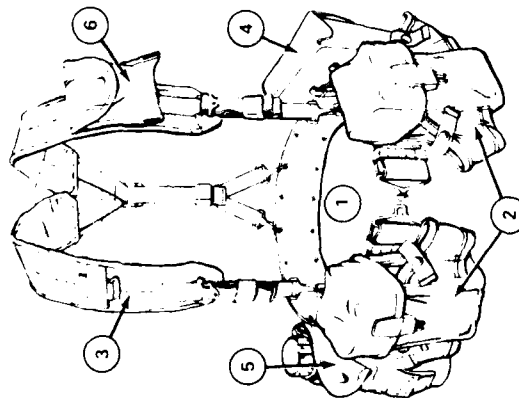


Figure 2-2.—Load carrying equipment.

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Adjusting the Pistol Belt

First, try on the belt for size. It should be comfortably snug—not tight. The following six steps in adjusting the pistol belt correspond to the six actions depicted in figure 2-3.

1. Push the two metal keepers between the adjusting clamp and the belt buckle toward the buckle.
2. Unlock the adjusting clamp by spreading the looped webbing apart.
3. Slide the clamp toward the belt buckle to loosen or away from the buckle to tighten.
4. Squeeze the adjusting clamp to lock it in place.

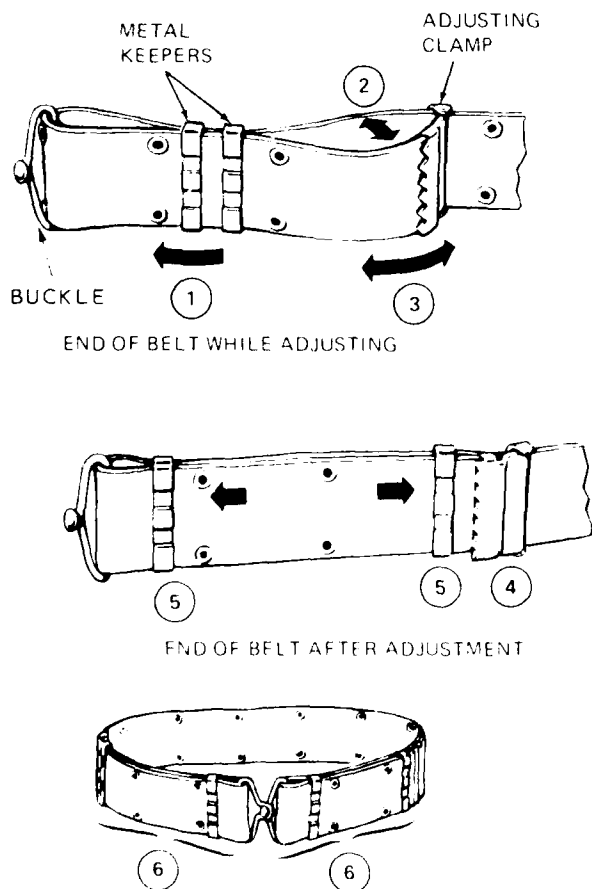


Figure 2-3.—Adjusting the belt.

5. Move the metal keepers so that one is next to the adjusting clamp and the other is next to the buckle.

6. Adjust the other end of the belt the same way. Both clamps should be about the same distance from the buckle.

Your belt is now ready for attaching the equipment onto it.

Attaching the Ammunition Pouch to Your Belt

The following four steps in attaching the ammunition pouch to your belt correspond to the four actions depicted in figure 2-4.

1. Pull each keeper up to its open position and slide them over ONLY one thickness of webbing.

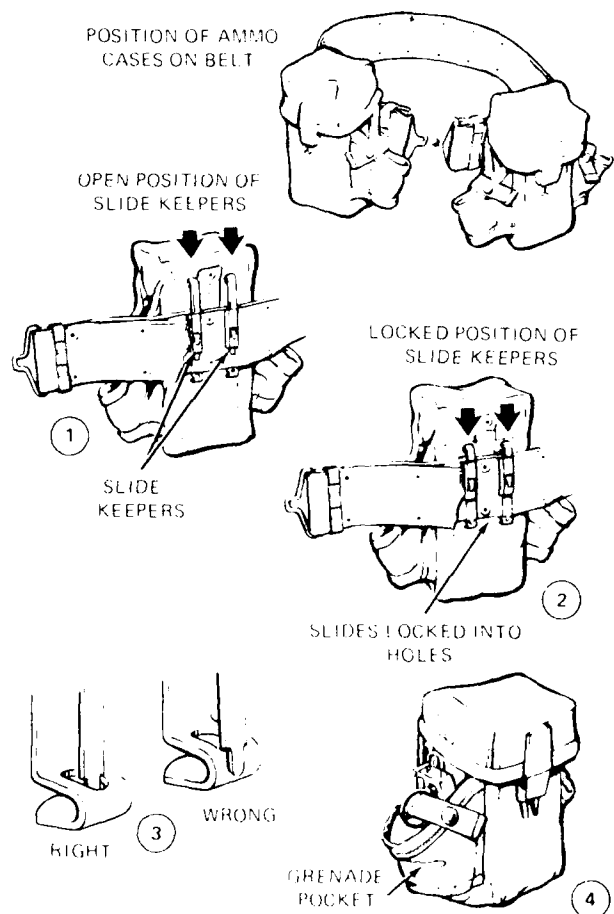


Figure 2-4.—Attaching ammo pouch to belt.

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Make sure the keepers are vertical and the bottoms are out beyond the webbing.

2. Push the slides of the keepers down and into the bottom holes.

3. Make sure you push the slides firmly into the holes; otherwise the slide will be in the **WRONG** position as shown in the sketch and the equipment could fall off.

4. Pockets for carrying fragmentation hand grenades are on each side of the ammo pouch. Be sure, after putting them in, that the nylon strap goes through the ring and is snap fastened, as shown in the sketch.

● If you have 20-round magazine pouch for the M16 rifle, refer to step 6 of the following procedure to attach them.

Attaching the Suspenders to the Ammunition Pouches and Belt

The following six steps in attaching the suspenders to the ammunition pouch and belt correspond to the six actions depicted in figure 2-5.

1. Snap hooks for attaching the suspenders to the belts are opened by pushing the hook up and out of the side retaining closure. When the hook is engaged into eyelets, snap it back into its closed position.

2. Attach the back suspender strap hooks into eyelets (top row of belt) located to the right and left of the eyelet centrally located on the back of the equipment belt.

3. Attach the front suspender strap hooks to the strap support eyelet located on top back of ammunition pouch.

4. Web and metal loops are provided on each shoulder strap to which small items (first aid/compass case, flashlight) can be attached.

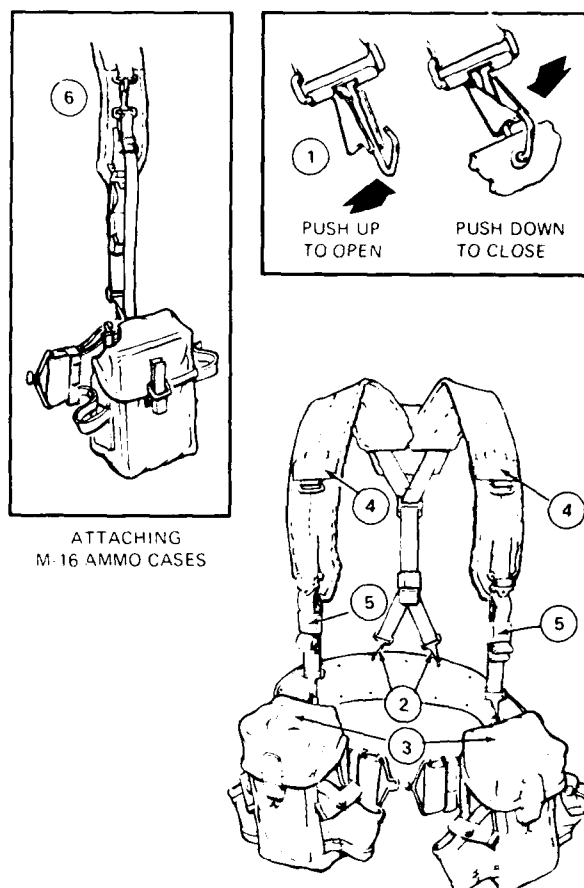


Figure 2-5.—Attaching the suspenders to the ammo pouches and pistol belt.

5. The elastic loops on each of the adjustment straps are used to secure the loose ends of the straps after adjustment.

6. When ammo pouches are not used, attach the front suspender straps to the eyelets on either side of the belt buckle. If M16 ammo pouches are used, attach to the suspenders, as shown in the sketch.

Attaching the Entrenching Tool Carrier

Attach the carrier to the belt on the left side by means of the two slide keepers on the back of

the carrier as close as possible to the ammunition pouch. (See fig. 2-6.)

NOTE: Place the entrenching tool in the carrier so that the handle faces toward the front and the shovel blade is to the back of the carrier.

Attaching the Canteen Cover

1. Attach the cover onto the right side of the belt by means of the two slide keepers on the back. Attach it as close as possible to the ammunition pouch. (See fig. 2-6.)

2. A small pocket is provided on the canteen cover for carrying water purification tablets. A touch and close fastener is provided for securing the pocket flap.

Attaching the First Aid Dressing/Compass Case

This case can be attached by means of the slide keeper on the back of the case in either of the following positions. (See fig. 2-6.)

1. To the belt on the right side next to the ammunition pouch. This is the preferred position.
2. Onto the webbing loop on the front of the suspenders.

Attaching the Bayonet Scabbard

Attach the bayonet scabbard by its hooks to the lower eyelets of the belt between the ammunition pouch and entrenching tool carrier.

Adjusting the Front and Back Suspender Straps

After the equipment is attached to the belt and suspenders, put it on. The following four steps in adjusting the front and back suspender straps correspond to the four actions depicted in figure 2-7.

1. Fasten the belt buckle.
2. Adjust the length of the back and front straps so that the belt hangs evenly in the desired position at the waist by pulling down on the loose end of the strap to tighten or lifting the end of the buckle to loosen the strap.
3. After the belt is in the best position around your waist by securing the loose ends of the straps with the elastic loops.
4. The adjustment of the back strap is made the same way, but it is best done with the help of another person to make the adjustment.

Care should be taken in adjusting the back and front straps so that not only does the belt hang at the proper waist level but that the yoke is positioned for your maximum comfort.

NOTE: You may be required by different SEABEE units to wear more or less equipment than stated in this text. This is also true in reference to the position of the equipment.

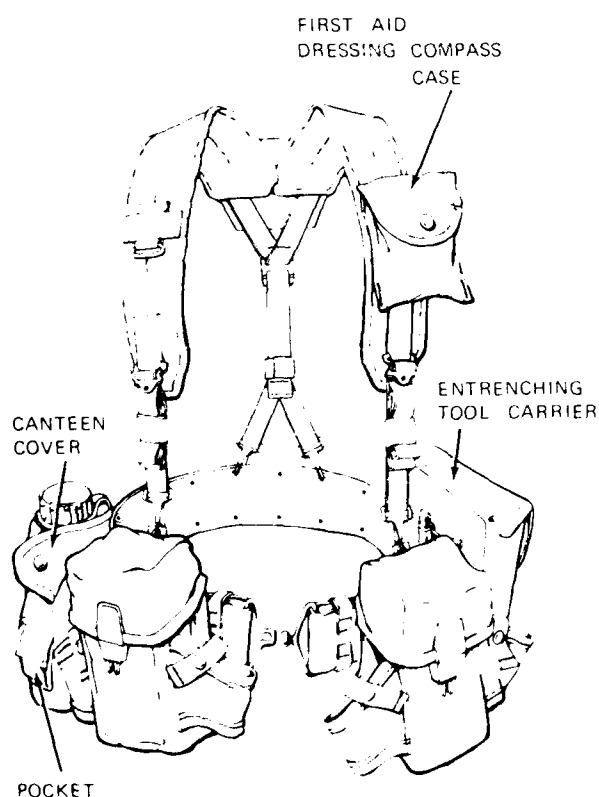


Figure 2-6.—Attaching entrenching tool carrier canteen cover, and first aid dressing/compass case.

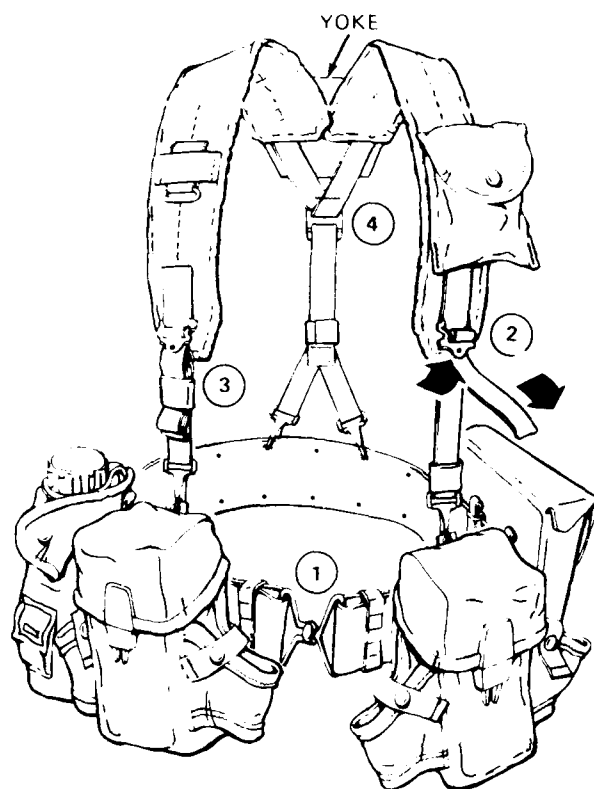


Figure 2-7.—Adjusting suspender straps.

Your Individual Existence Load Carriers

The following ten items of the existence load carrier are identified, numerically, in figure 2-8.

1. 1 each frame, pack, ground troops
2. 1 each strap, lower back
3. 1 each strap, waist
4. 1 each strap, shoulder, without quick release
5. 1 each strap, shoulder, with quick release
6. 1 each shelf, cargo support
7. 2 each strap, cargo tie-down
8. 1 each pack, combat, medium
9. 1 each pack, combat, large
10. 1 each cover, field pack, camouflage (for either medium or large pack)

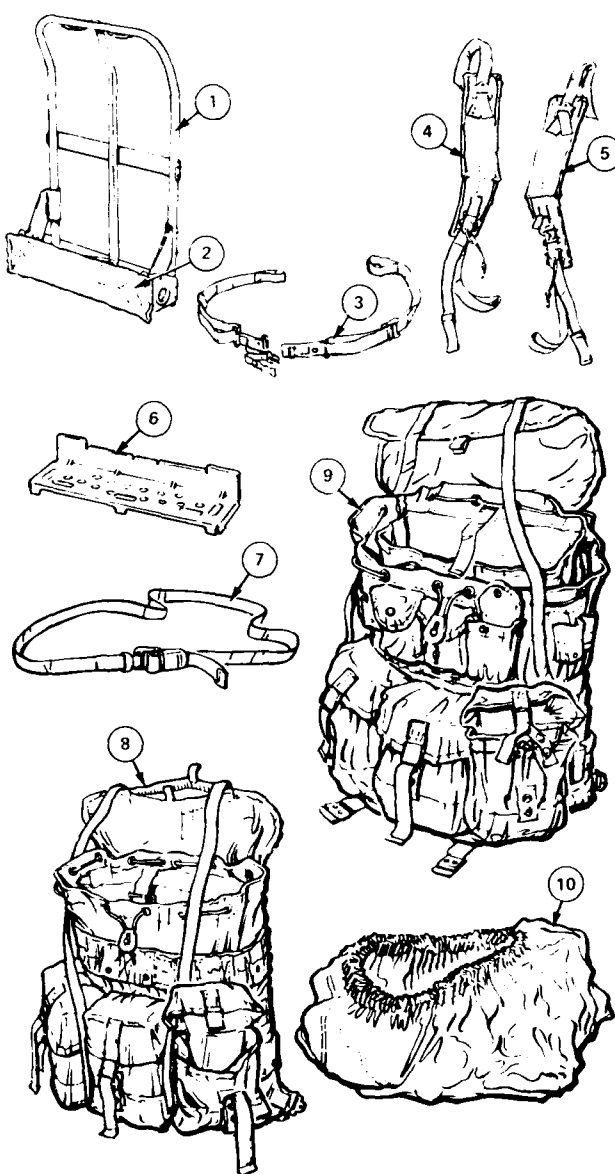


Figure 2-8.—Individual existence load carriers.

ADJUSTING THE PACK FRAME LOWER BACK STRAP.—Your pack frame is used to carry cargo or the large pack. Sometimes it can be used to carry the medium pack, but not usually.

For your maximum comfort in load carrying, the frame is built with an adjustable lower back strap to keep the load away from your back and to allow air circulation between your back and

the load (fig. 2-9). When the turnbuckle is screwed tight, the strap is almost flat. If your waist is small, the turnbuckle should be loosened enough to allow the back strap to curve in and fit against your lower back.

ATTACHING YOUR EXISTENCE LOAD SHOULDER AND WAIST STRAP.—The shoulder straps are used with the following carriers:

1. Frame when used to carry a load with the cargo shelf attached to it
2. Frame with the large pack attached to it
3. Medium pack without the frame
4. Frame with the medium pack attached to it (See fig. 2-10.)

ATTACHING THE SHOULDER STRAPS.—One strap is for your right shoulder, and the other, with the quick release assembly, is for your left shoulder. The quick release assembly is described later in this chapter.

The following three steps for attaching the existence load shoulder and waist straps correspond to the three actions highlighted in figure 2-10.

1. Insert the looped end of the strap from the **INSIDE** of the frame through the nylon ring at the bottom side, thread the strap through the loop, and pull tight.

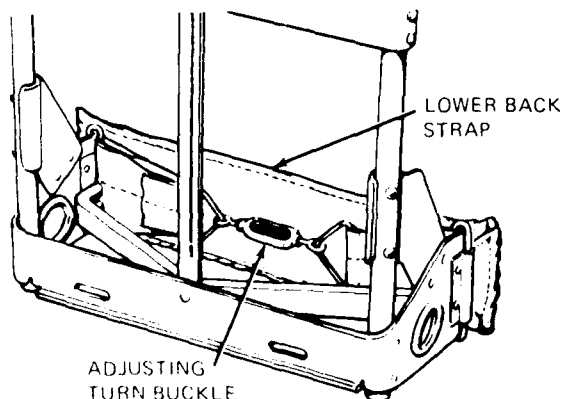


Figure 2-9.—Lower part of pack frame.

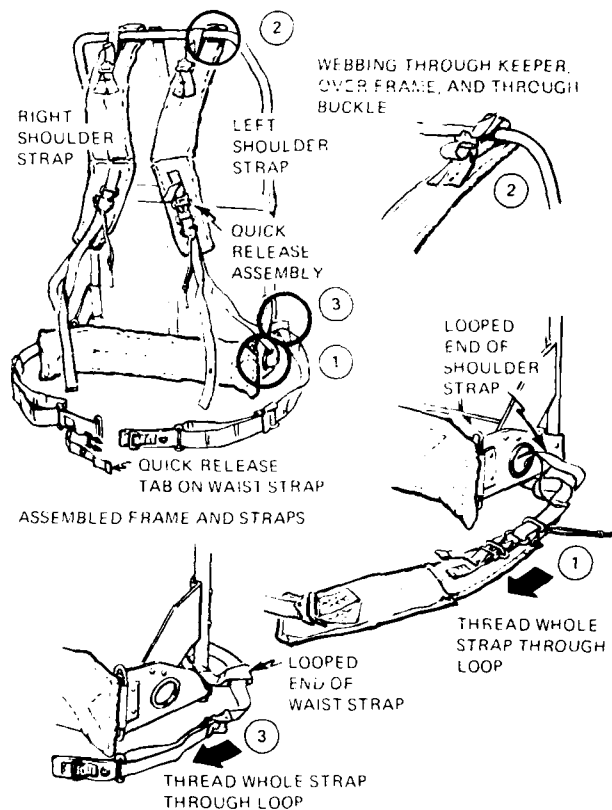


Figure 2-10.—Attaching shoulder and waist straps to pack frame.

2. Insert the webbing at the top of your strap through the metal keeper on the top of the frame, through the buckle, and pull tight. The padded end of the strap should normally be under the frame bar.

Like the shoulder straps, the waist straps also are made with a quick release assembly. The pull tab is shown on the strap assembled to the frame. Attach the strap with the pull tab, either on the left or right of the frame depending on which hand you use to pull it open.

3. Insert the looped end of the waist strap around the lower part of the frame, as shown, and pull tight.

ATTACHING THE CARGO SHELF AND CARGO TO THE FRAME.—The cargo shelf is very simply slipped onto either the middle or bottom of the back of the frame, as shown in figure 2-11, view A. It is used to support such loads as 5-gallon water or gas cans, cases of ammunition, field rations, radio, or other bulky items.

A load is shown partially tied to the frame with the cargo tie-down straps (fig. 2-11, view B). Two are furnished with each issue.

The tie-down strap buckle is made for a very secure hold of the load to the frame. Proper adjustment, however, is important. The top strap, shown in figure 2-11, view B, is wrapped around the load and frame but not pulled tight. To secure the load, the hooked end should first be inserted in the buckle, as shown in view C, and the loose end pulled in the direction of the arrow for a fairly tight hold, but leaving some slack. The fastener is then pushed into the closed position, shown in

view D, which will take up the slack that was left. If enough slack is not left before closing the fastener, closing it will put too much tension on the strap so that it will not fully close; or if the load is contained in a soft container, the closed strap may crush the contents.

To release, pull up on the end of the strap to open the fastener.

ADJUSTING THE SHOULDER AND WAIST STRAPS.—Your shoulder and waist straps have adjustment buckles that are used after the straps are attached to the loads and you have the straps and load over your shoulder.

The following two steps for adjusting the shoulder and waist straps correspond to the two actions depicted in figure 2-12.

1. Shoulder Straps. Pull down on the loose end of the webbing to shorten the strap. To

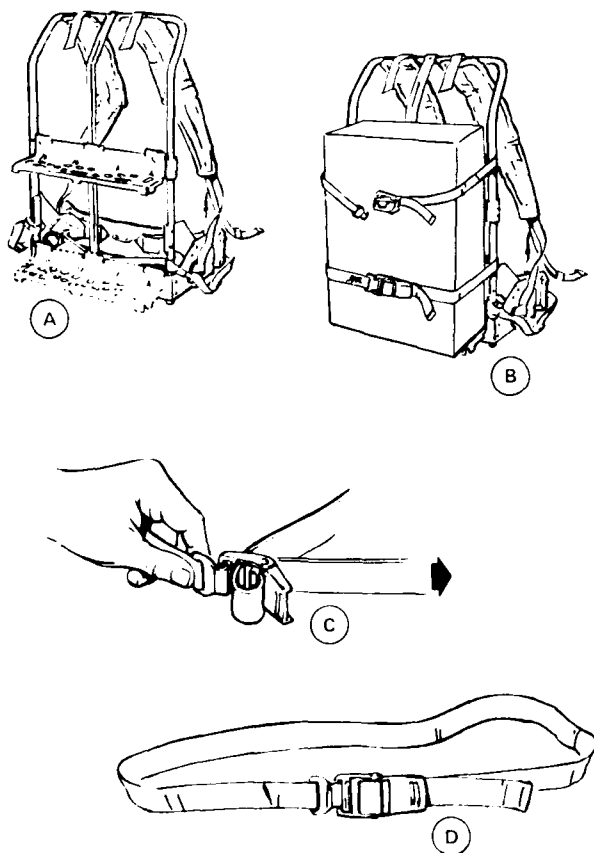


Figure 2-11.—Attaching cargo shelf and load.

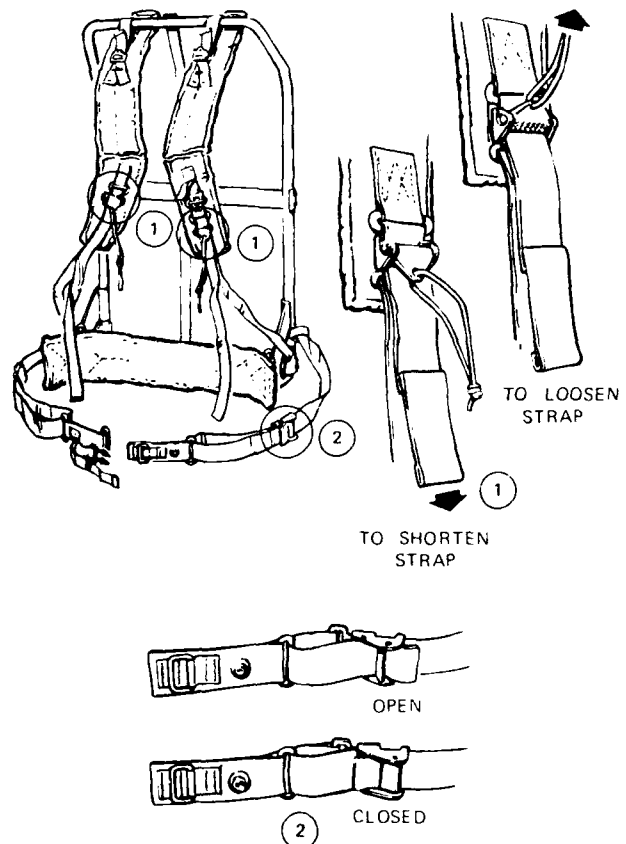


Figure 2-12.—Adjusting shoulder and waist straps.

lengthen it or to loosen it for slipping off the load easily, pull up on the cords.

2. **Waist Straps.** Open the buckle and slide it either away from or toward the front. Sliding it away from the front will tighten the strap; sliding it toward the front will loosen the strap. Close the buckle to hold the adjustment.

MEDIUM PACK

The medium pack, designed to carry up to 50 pounds of various existence load items, is the one generally used by most combat troops. Figure 2-13 shows front and back views. The pack is water repellent but not waterproof. Four waterproof liners are issued with each pack: one large one for the main compartment and three small ones for each of the three pockets. Equipment to be carried should first be inserted

in the waterproof liners, then into the main compartment and pockets. Instructions for making a watertight closure are printed on the outside of each liner.

The small pocket in the main compartment can be used to carry the AN/PRC-25 or AN/PRC-77 radio.

The main flap for covering the loaded pack can be opened by pulling apart the two tabs. The camouflage cover or other small flat objects can be stored in it. Simply pressing the flap together seals it.

Equipment hangers (webbed loops and webbing with eyelets) for use with slide keepers and/or hooks are provided on the sides of the pack and above the pockets for carrying equipment on the outside of the pack.

For carrying equipment, such as a bayonet scabbard or machete sheath, the pockets are tunneled between the pockets and main compartment. By sliding the piece down through the tunnel, it can be fastened to the hanger above it with slide keepers or hooks.

The medium pack is most commonly carried using the shoulder straps without the frame. When required, the pack can be attached to the frame and shoulder straps in the same way as is shown later for attaching the large pack to the frame.

Closing the Loaded Medium Pack

Once your pack is loaded, close and tighten as follows:

The following three steps for closing the loaded medium pack correspond to the three actions depicted in figure 2-14.

1. Close the top of the pack by using the drawstring buckle. Pull the two cord ends, as shown, to gather the top into a tight closure.

2. To loosen the drawstring, push the button on the buckle up with your thumb and pull down.

3. Each pocket is closed by threading the webbing through the buckle and pulling tight. For ease of opening a pocket, unsnap the lower end of the tie down. This will let you close the pocket again without threading the webbing through the buckle.

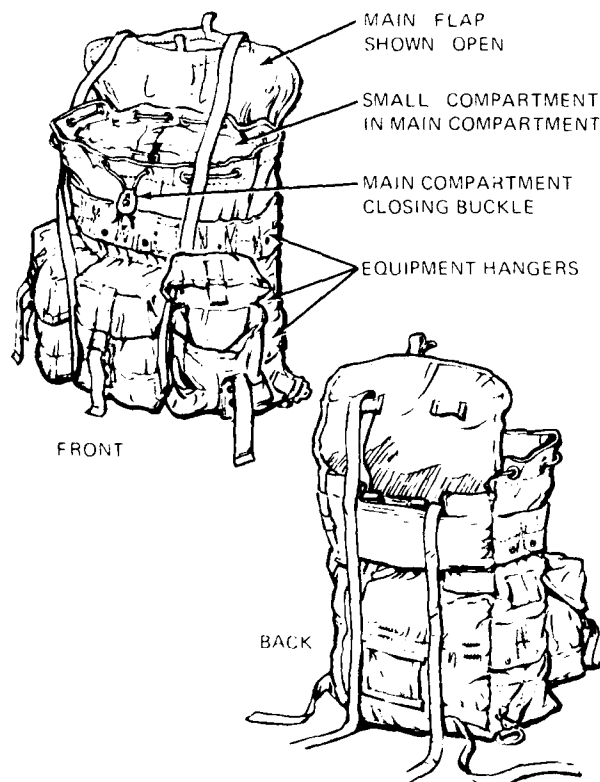


Figure 2-13.—Front and back views of medium pack.

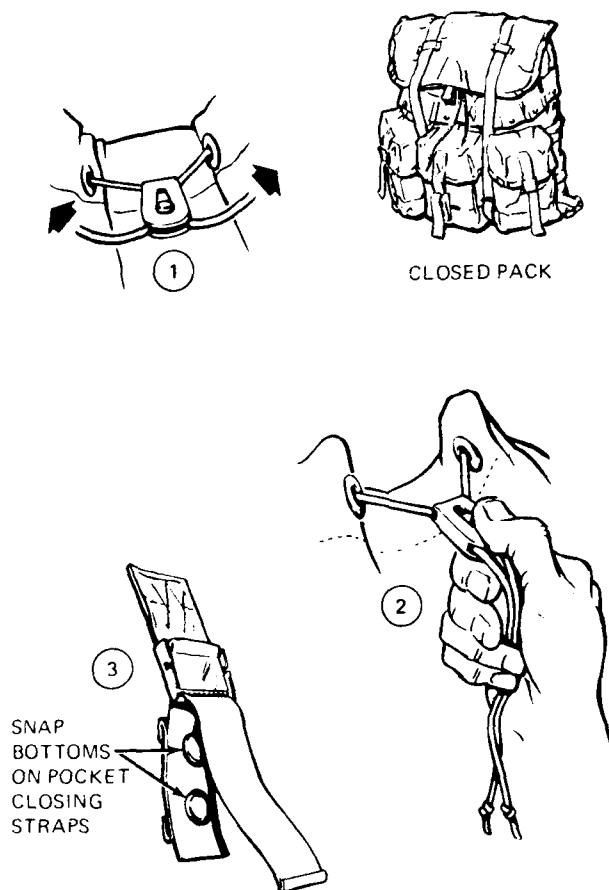


Figure 2-14.—Buckles for closing and opening pocket flaps and main compartments.

Insert the main flap tie-down straps through the webbed loops on top of the main flap, pull down over the pack through the bottom buckles, and pull tight.

Attaching the Shoulder Straps to the Medium Pack

The medium pack is often carried using the shoulder straps without the pack frame, as shown in figure 2-15.

To attach the straps to the pack, follow the same procedure as used in attaching the straps to the frame, that is:

1. Insert the looped end of the strap through the "D" ring at the bottom of the pack through

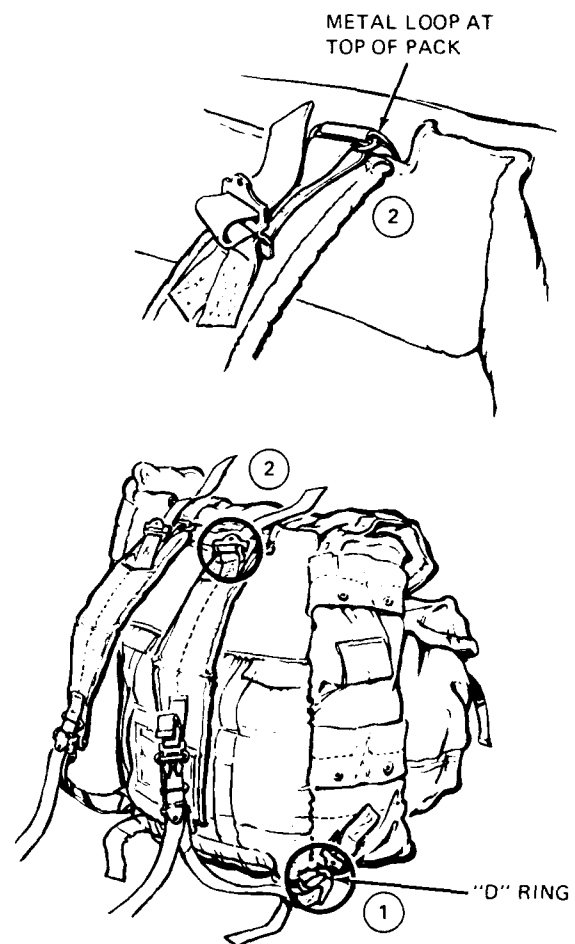


Figure 2-15.—Attaching shoulder straps to medium pack.

the strap loop and pull it tight. (See fig. 2-15, view 1.)

2. Insert the webbing at the top of the strap through the metal loop on the top of the pack and pull it tight. (See fig. 2-15, view 2.)

Be sure that the strap with the quick release is over your left shoulder.

CAUTION: When the medium pack is to be worn in extreme cold climates, it must be worn on the frame. See figure 2-18 for the manner of attachment. Using the frame will prevent accumulation of perspiration in the area where the pack contacts the back of the individual, which could cause rapid cooling of the individual.

Attaching Your Bedroll

The bedroll can be carried inside the pack or attached to the outside. Figure 2-16 shows one way of carrying it by attaching it to the bottom of the medium pack with two cargo straps pulled through the loops on the bottom of the pack.

LARGE PACK

The large pack is a special purpose pack used to carry excessively large loads (up to 70 pounds) that would be required for Arctic or other special missions. It is much the same as the medium pack except for its larger size and three more small pockets at the top. (See fig. 2-17.) There are tie-down cords and "D" rings inside the main compartment to shorten the pack if it is not filled to capacity. The three lower pockets are tunneled to allow the carrying of skis and other equipment, and they have cords at the top for better sealing of the pocket before closing the flap.

It is recommended that the large pack always be carried on the frame.



Figure 2-16.—Bedroll attached to medium pack.



Figure 2-17.—Front and back views of large pack.

Attaching the Large Pack to the Frame

Figure 2-18 shows the large pack on the pack frame. To attach it to the frame, complete the following steps:

1. Insert the bare frame into the envelope on the back of the pack. (See fig. 2-18, view 1.)
2. Secure the bottom of the pack to the frame, as shown. Note that the webbing is looped around the frame TWICE before buckling. Attach the shoulder straps and waist straps as previously described. (See fig. 2-18, view 2.)

Quick Releases

In emergency situations when sudden removal of your backpack is required, quick releases are provided on the left shoulder strap and the waist strap.

Views 1 through 4 of figure 2-19 show how the shoulder strap quick release is assembled. The metal loop at the top of the lower end of the strap (view 1) is hooked over the metal loop (view 2). The plastic prongs (view 3) are pushed down through so that the locked assembly is as shown in view 4.

Views 5 through 8 of figure 2-19 show how to assemble the quick release on the waist strap.

For sudden release, first pull the tab on the waist strap (view 8) and follow immediately by pulling up on the tab on the shoulder strap

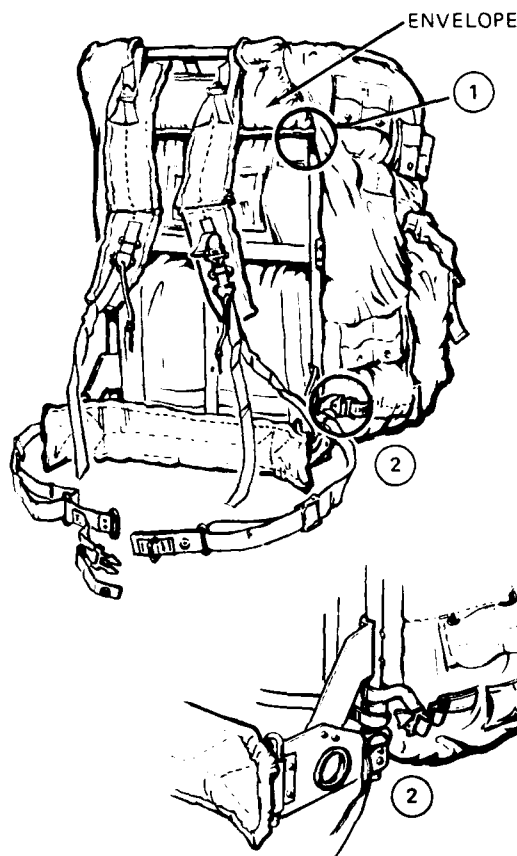


Figure 2-18.—Attaching the large pack to the frame.

(view 9). Shift the load toward your right and let it slip off your right shoulder.

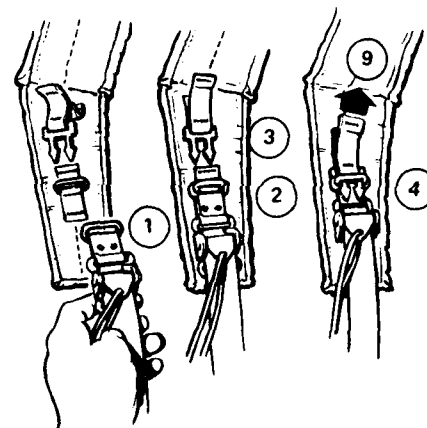
CLEANING AND MAINTENANCE

Water repellent treated nylon duck and webbing was used to fabricate all of the fabric items of equipment. The entrenching tool carrier is molded of ethylene-vinyl acetate. The pack frame and cargo shelf are fabricated from aluminum with solid steel rivets in certain high stress areas.

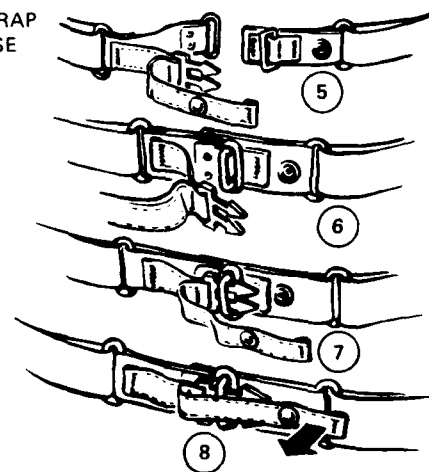
The equipment can be cleaned by removing mud or other foreign matter with a brush, damp or dry cloth, or by scrubbing the

exceedingly dirty areas utilizing the following procedure:

1. Scrape dirt or mud from the equipment using a flat stick or a dull instrument which will not cut the fabric or webbing.
2. Remove loose dirt from soiled surfaces using a cloth or soft brush.
3. Wet out the surface and apply a warm solution of detergent, laundry, powdered, MIL-D-12182, type II, NSN 7930-00-252-6797. Scrub with soft brush, cloth, or sponge.
4. Flush the item thoroughly with clean, warm water until all the cleaning solution has been rinsed away.



SHOULDER STRAP
QUICK RELEASE



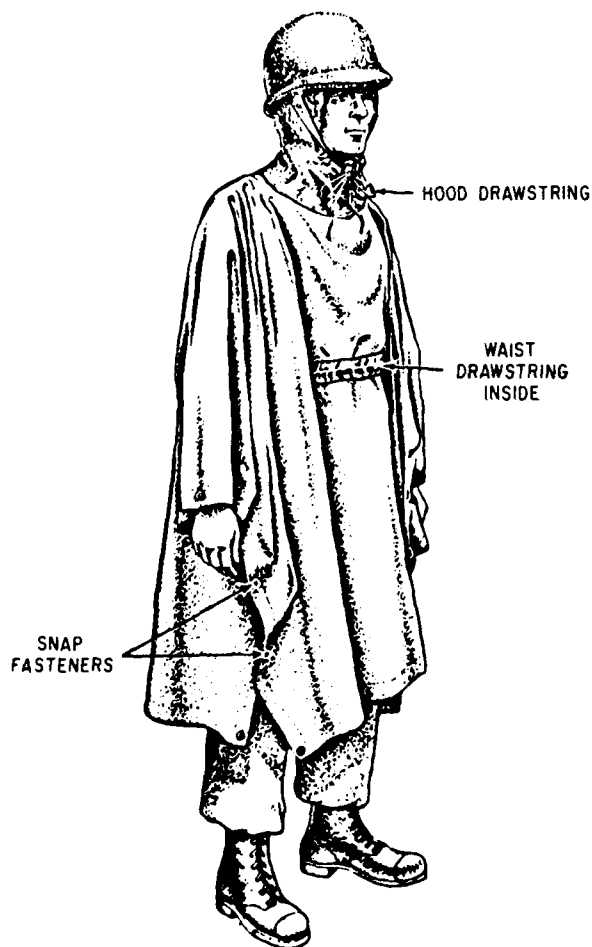
WAIST STRAP QUICK RELEASES

Figure 2-19.—Shoulder strap and waist strap quick releases.

5. Dry the item or equipment away from direct sunlight, direct heat, and open flames.

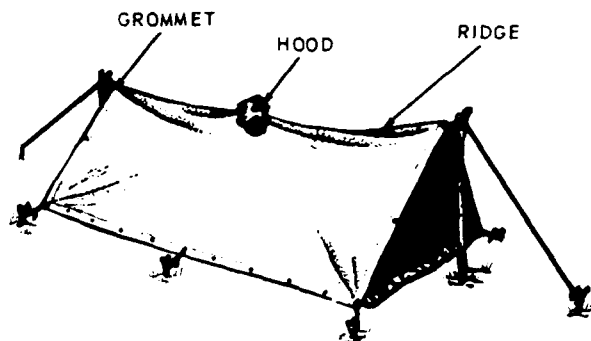
BIVOUAC EQUIPMENT

Bivouac equipment is designed to provide you with the minimum necessities while living in the field. It is carried in or on the load-carrying equipment as explained below. Take care of your equipment and it will take care of you.



187.12

Figure 2-20.—Poncho worn as raincape.



187.13

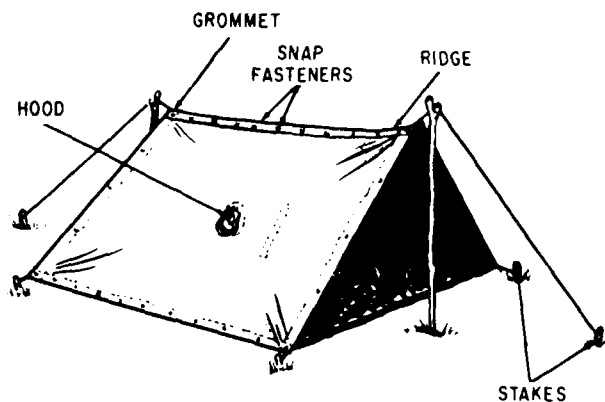
Figure 2-21.—One poncho used as one-man shelter.

This equipment consists of the following items:

1. Poncho
2. Shelter half
3. Entrenching tool
4. Canteen and cup
5. Mess kit

Poncho

The poncho, with hood, is made of waterproof nylon cloth. It is roughly rectangular



187.14

Figure 2-22.—Two ponchos for two-man tent.

Chapter 2—SPECIAL CLOTHING AND EQUIPMENT

in shape with the long side parallel and the short sides slightly curved. The hood and the opening for the neck are located in the center. Drawstrings are located at the neck and waist.

You can use the poncho as a rain garment, shelter, ground cloth, or a sleeping bag.

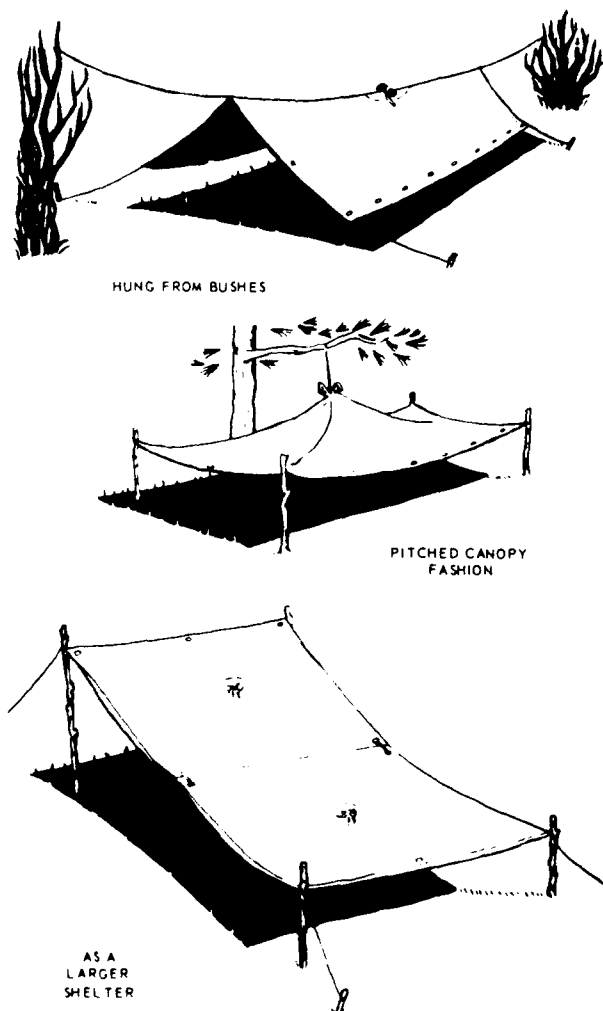
The poncho may be worn as a raincape with the arms inside or it may be worn with the arms outside for freedom of movement

(fig. 2-20). To put the poncho on, slip it over the head. If the poncho is to be worn, adjust the hood drawstring to fit. The helmet and liner are worn over the hood. Fasten the snap fasteners on the sides to prevent the poncho from flapping in high winds.

Various types of shelters and lean-tos can be made by attaching ponchos to trees, tree branches, bushes, sticks or poles. Always dig a ditch around the edge to help drain off rainwater. (See figs. 2-21, 2-22, and 2-23.) The poncho may be used as a ground cover for shelters and as a waterproof barrier between the ground and sleeping bag.

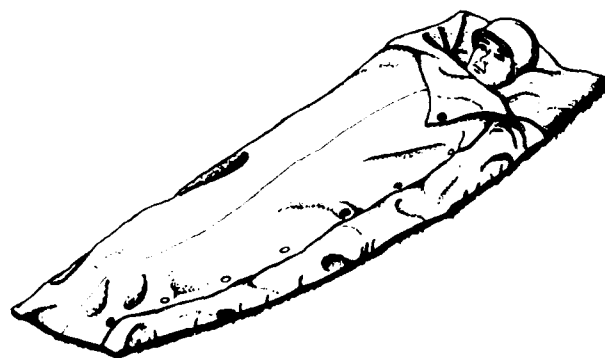
The poncho may be used as a sleeping bag either by itself or in conjunction with a blanket (fig. 2-24). Spread the poncho flat on the ground, making sure the hood opening is tightly closed. If a blanket is used, place it on top of the poncho, fold the poncho and blanket in half lengthwise, and fasten the snaps together. If the poncho is being used without a blanket, snap the sides together along its entire length and tuck the foot end under to keep the feet from sticking out.

When the poncho is being used as a sleeping bag in a combat area, **DO NOT FASTEN THE SNAP FASTENERS TOGETHER; THEY CANNOT BE OPENED QUICKLY.**



187.15

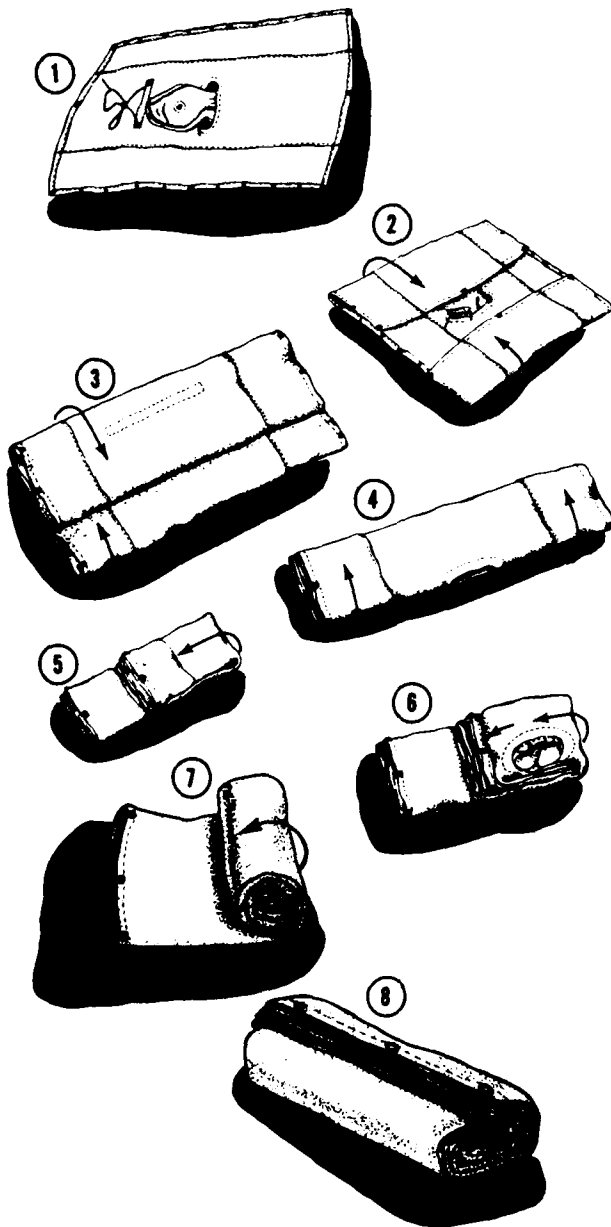
Figure 2-23.—Several ways ponchos can be used for shelter.



187.16

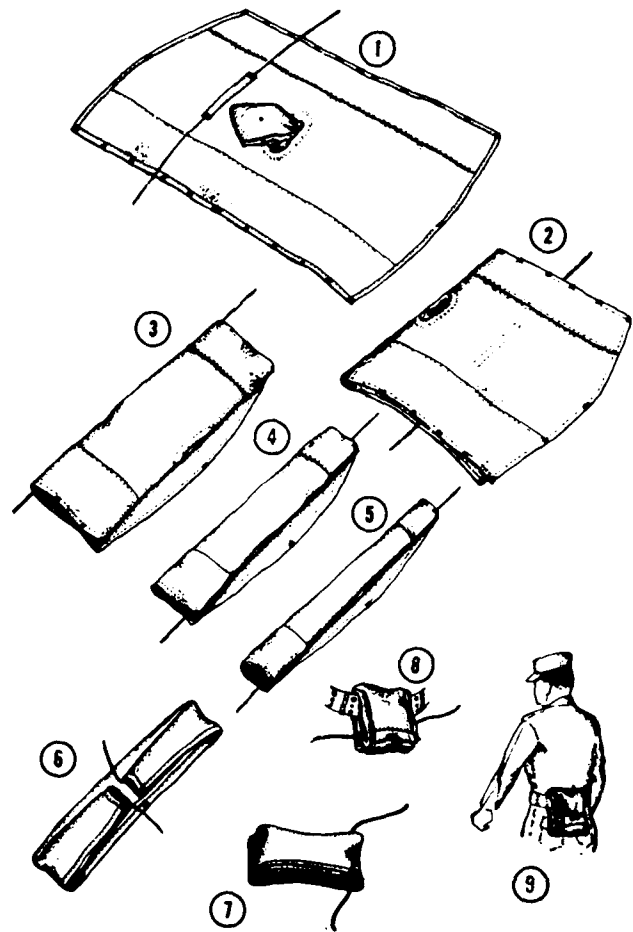
Figure 2-24.—Poncho used as sleeping bag.

The poncho can be folded and packed for carrying with your individual load-carrying equipment or for carrying over your pistol belt. It can be carried in a duffle bag or inside the field pack if space permits. See figures 2-25 and 2-26 for steps in folding the poncho.



187.17

Figure 2-25.—Folding poncho for carry with load-carrying equipment.



187.18

Figure 2-26.—Folding poncho for carry over pistol belt only.

Shelter Half

The shelter half is made of water-repellent and mildew resistant cotton duck. It is 154 1/4 inches long and has a triangular fly at each end. It is issued to you with five tent pins, a guy line, and a three-section tent pole. The shelter half, when joined to your buddy's by buttons or snap fasteners, forms a shelter for two men. Be sure when you are issued your gear that your friend has the same type fasteners that you do. See figure 2-27 for the proper procedures to follow in pitching the two-man shelter tent. Six shelter halves can be joined together to make a six-man

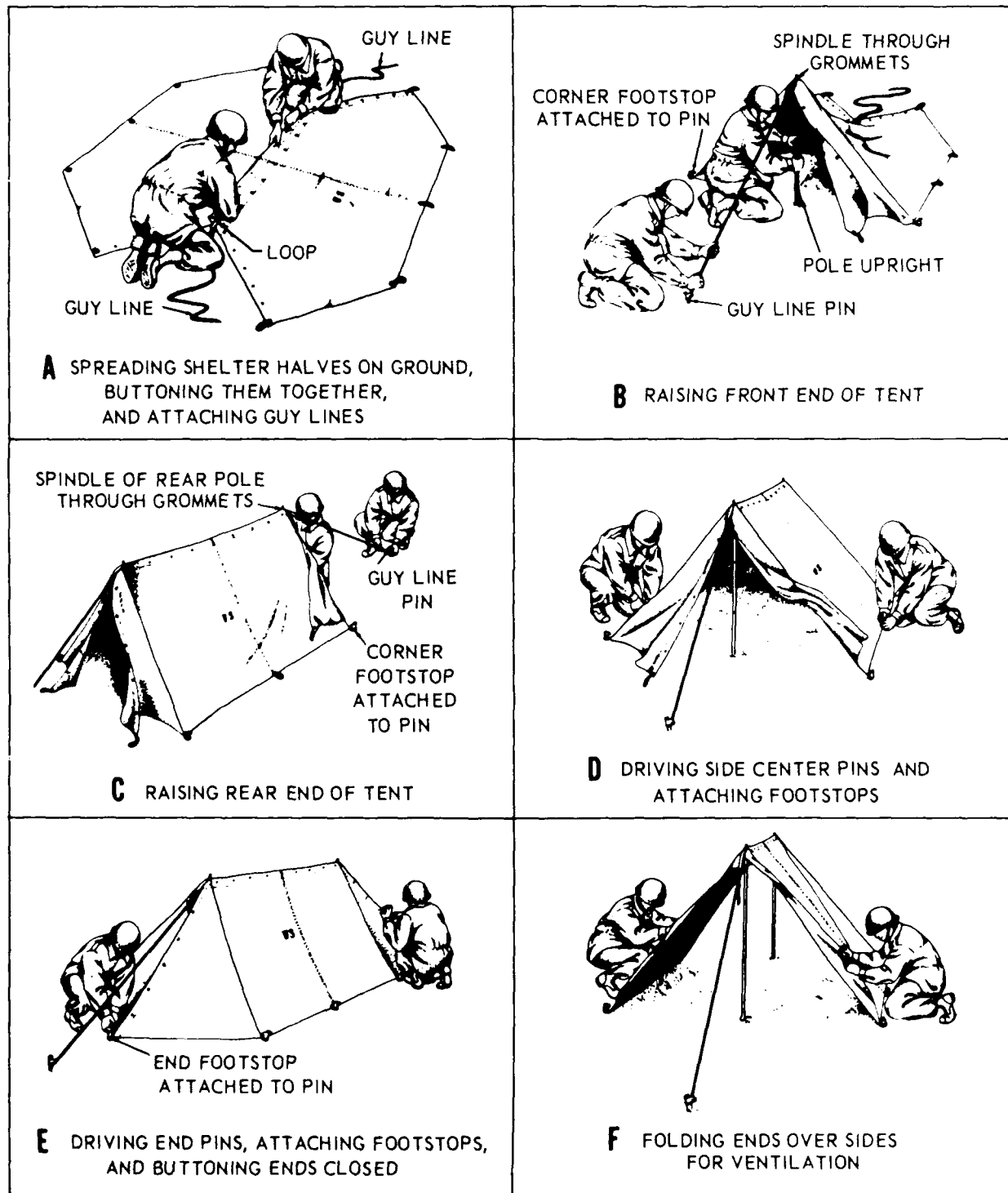
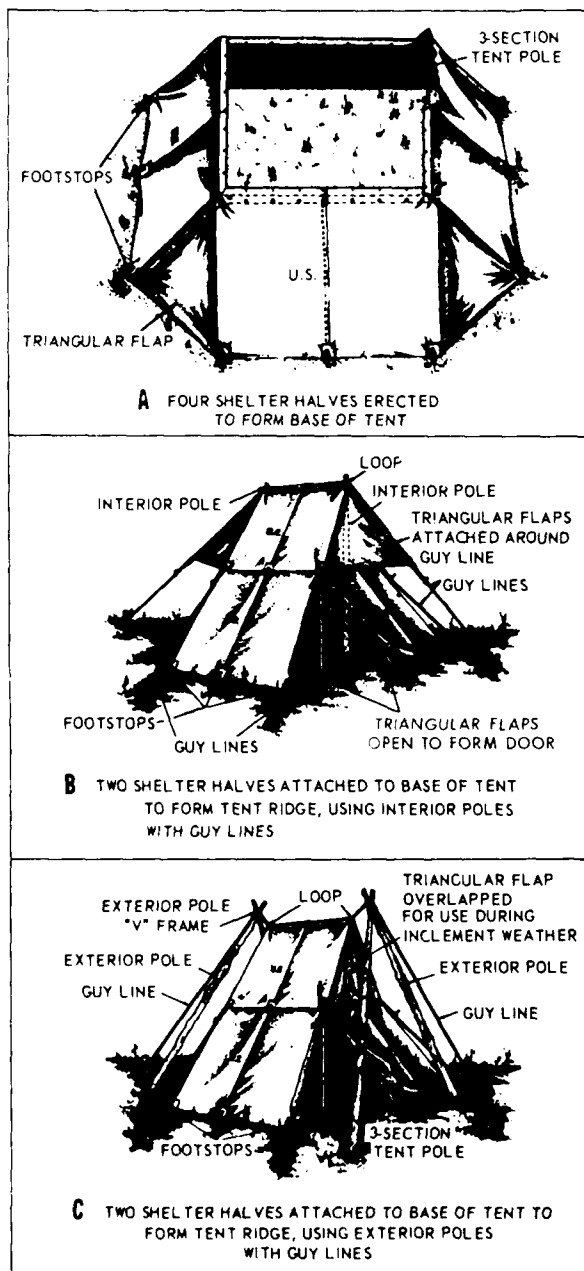


Figure 2-27.—Procedures in pitching shelter half tent.



187.20

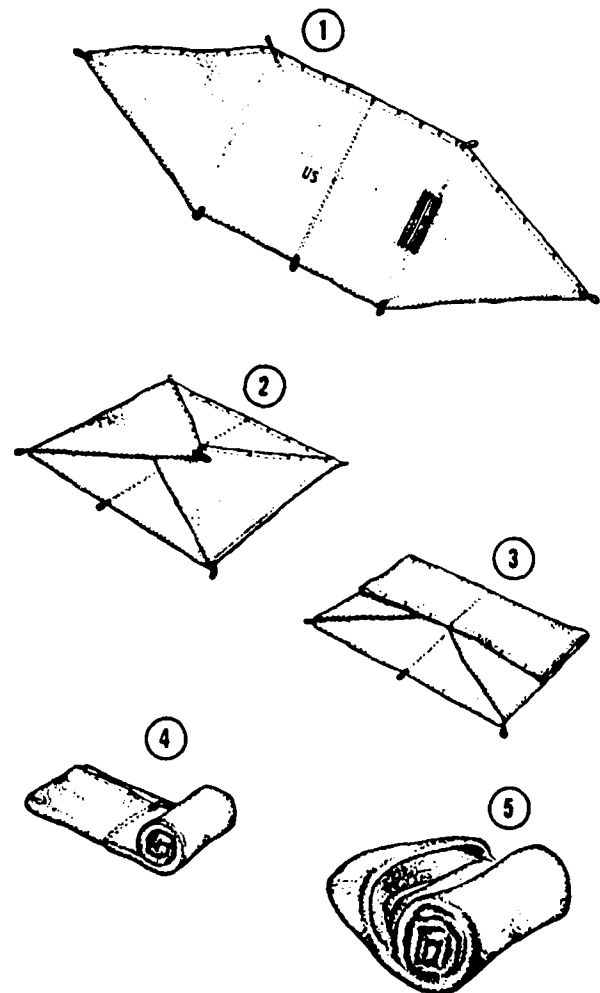
Figure 2-28.—Procedures for pitching six-man tent.

tent. (See fig. 2-28.) You can also use the shelter half by itself for shade or shelter.

To fold the shelter half, spread it out flat with the button side down. Next, place the tent-pole sections, pins, and guy lines in the center and follow the procedures in figure 2-29. Carry the rolled shelter half under the expandable flap of the field pack or attached to the bottom.

Entrenching Tool

The combination entrenching tool has a pick blade and a shovel blade. Each blade can be



187.21

Figure 2-29.—Folding shelter half.

moved to any of three positions by loosening the locking nut at the blade end of the handle, adjusting the blade to the desired position, and tightening the nut again. The tool can be used for digging fighting holes, breaking hard ground, and clearing brush or undergrowth. Do not use it for cutting large-size timber. After the tool is used, it should be cleaned and the threads of the locking nut kept oiled. When carrying the entrenching tool, turn each blade so that it is parallel with and against the handle.

Canteen and Cup

The canteen may be metal or plastic; both are used with the same cup and carrier. Keep the canteen and cup drained and dry when they are not in use. Even a small amount of water left inside the canteen may discolor the metal or cause the contents to have an unpleasant taste or odor. Never use the canteen for anything except water; carbonated drinks or other beverages with an acid content may discolor it. If the cap of the metal canteen becomes loose, wad a small clean cloth into the top of the cap to prevent leakage. Do not try to make the cap fit tighter by screwing it down harder. Most caps will split if not used properly. Never put the plastic canteen in open flame or on a burner plate.

Mess Kit

Your mess kit consists of a knife, fork, spoon, meat tray, and vegetable tray. The two trays are placed together to form a container for the knife, fork, and spoon. The kit is carried in the field pack.

To assemble the kit for eating, separate the two trays by raising the handle of the bottom (meat) tray. Next, slide the D-ring of the top tray over the handle of the bottom tray, pushing the two together.

To clean your mess gear, slip the knife, fork, and spoon over the handle and dip them all in hot soap or synthetic detergent solution, holding them by the handle. Use a brush to wash off any food and grease; then rinse thoroughly in clean boiling water. Air-dry the gear by swinging it back and forth until it is completely dry. Never wipe your mess gear with a wet cloth.

PROTECTIVE EQUIPMENT

Protective equipment includes items designed primarily to protect you from injury, either from the enemy or from nature, and consists of the following:

1. Helmet and helmet liner
2. Camouflage cover
3. Hat and mosquito net

Helmet and Helmet Liner

Wear the helmet over the helmet liner for protection against fragmentation from artillery fire and grenades and against ricocheting bullets. The helmet and liner may be worn over the watch cap or over or under the poncho hood. Although the helmet is a sturdy item and can withstand rough treatment, the following should be observed.

1. Do not cook in the helmet as the heat will destroy the temper of the metal and weaken it.
2. Using the helmet as a shovel will result in the camouflaging being worn off, making it shiny and easily seen.
3. Avoid placing heavy objects on or sitting on the helmet; the chin strap loops may be snapped.

The helmet liner is worn with the M1 helmet for added comfort and added ballistic protection. It can be worn without the helmet in noncombat situations as a head covering. There are two types of liners: one with a chin strap assembly and one without. The helmet liner with chin strap assembly is similar in design to the helmet without one, with the following general exceptions:

1. The leather-lined headband may be provided with snap fasteners or attaching clips for attaching the head suspension band.
2. The straps of the cradle are provided with a cord at the center of the cradle for adjustment for head height.
3. The neckband is smaller, may or may not be adjustable, and is provided with snap fasteners for attachment to the inside of the liner.
4. The helmet liner without the chin strap assembly consists of a plastic-impregnated fabric

shell with a webbed suspension system (head suspension band and cradle) riveted to the inside, a headband, and a neckband.

The **HEADBAND** is a leather-lined web strap provided with six metal clips for attaching and adjusting the headband to the liner. To install the headband in the helmet liner, proceed as follows:

1. Open the six clips and adjust the headband to a larger size than your head size.
2. Put the headband on your head, making sure that the leather portion is against the forehead, the buckle is at the back, and the clips are open and facing up.
3. Adjust the headband to a snug fit, then remove it and insert into the liner so that the clips are up and the buckle to the rear.
4. Place the clips over the fixed web strap of the head suspension band, ensuring the two front clips are centered.
5. Close all the clips and adjust the head height of the liner by adjusting the straps with buckles inside the liner.

The **NECKBAND** is designed as an alternative to using the chin strap. It is a web strap with a long adjusting tape sewed to each end and a shorter tape sewed in the middle. To install the neckband, proceed as follows:

1. Thread the two long tapes into the small buckles at each side of the liner, making sure the smooth surface faces the front of the liner.
2. Thread the short tape into the rear buckle.
3. Make sure that all tapes are straight and free of kinks.
4. Put the liner on your head and adjust it to fit by tightening the long tapes uniformly so that the neckband fits snugly and comfortably against the back of the neck. Pull the short tape to take up the slack.

Camouflage Cover

The camouflage cover is worn over the helmet. It is reversible, having a dark pattern on one side (green) and a lighter pattern on the other (brown). To wear the cover, put it over the helmet, letting the chin straps protrude through the openings provided. Fold the bottom flaps into the helmet,

drawing them tight. Hold them in place by inserting the helmet liner.

Hat and Mosquito Net

Wear the hat and mosquito net for protection against mosquitoes and other insects (fig. 2-30). The cloth top piece has an elastic suspension that fits over the head or helmet. It may also be worn between the helmet and the liner. Metal rings hold the net away from the face and neck even when you are sleeping. The hat and mosquito net fit over the collar in back and are held in place in front by two elastic loops that can be attached to the pocket buttons of the shirt. An elastic draw tape at the bottom may be drawn tight when the head net is not fastened to the pocket buttons.

When the net is not being used, it can be carried in the helmet liner between the liner and the web of the headband.



187.22

Figure 2-30.—Mosquito hat and net over helmet.

SPECIAL ISSUE

Special issue items include all items not listed in the standard issue. These items are designed to increase your comfort, capability, and personal safety. Though the list of items given below is not complete, it includes the most significant items that you will be issued. Included are the following items which will be described later on:

1. Armor vest
2. Mountain sleeping bag
3. Sleeping mat
4. Canvas cot and insect bar frame
5. Insect bar
6. Camouflage band

ARMOR VEST

The armor vest (armor, body, fragmentation protective) is more commonly called a "flack jacket." There are many types in use, but they

are all designed to provide protection against low-weight, high-velocity shell, mortar, and grenade fragments. These fragments cause the major portion of combat casualties. For best results from the armored vest, observe the following instructions:

1. Wear the vest over your utility shirt but under additional outside clothing layers if possible.
2. Adjust side laces to make the armor vest fit the body, leaving enough room for air to circulate; above all do not fit it too tightly.
3. Use the protective side flaps to cover opening under side laces, and protect slide fasteners by fastening the snap closure.

MOUNTAIN SLEEPING BAG

The mountain sleeping bag (fig. 2-31) is a mummy-shaped bag with a quick-release slide fastener at the front opening. The bag is a

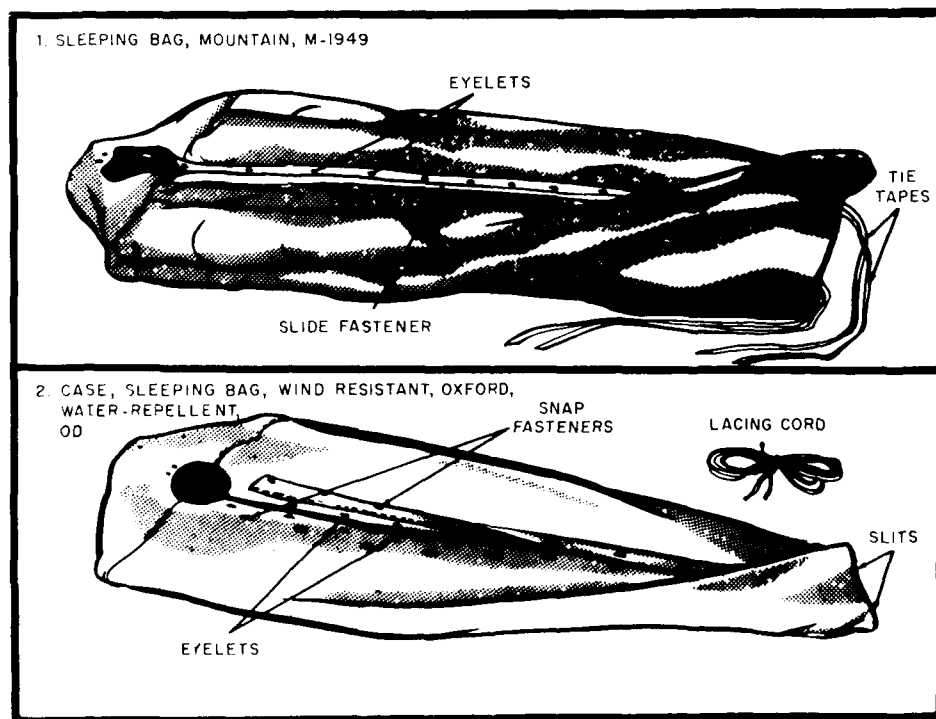


Figure 2-31.—Mountain sleeping bag and sleeping bag case.

SEABEE COMBAT HANDBOOK

quilted construction, filled with a mixture of down and feathers. The shape of the bag gives maximum warmth with minimum weight. A waterproof clothing bag is provided for carrying and storing. The bag is laced to an outer sleeping bag case, also illustrated in figure 2-31. The tie tapes at the bottom of the bag are used to fasten the bag at the bottom of the sleeping bag case and to secure the bag for packing after folding and rolling. The mountain sleeping bag is intended for use in locations where the temperatures range from 14° to 45°F.

Here are some useful hints on the care and use of the sleeping bag.

- Always use the sleeping bag case to protect the bag and provide extra warmth.

- Keep the sleeping bag dry. Breathe through the face opening to keep your breath from wetting the bag.

- Fluff the bag after unrolling.

- Put padding under the bag for warmth and comfort. Use the pneumatic mattress, packboard, clothes, or fir boughs for padding.

- Do not wear too many clothes when in the bag. Put some of them under the bag.

- If your face is too cold, cover it with a towel or muffler.

The bag is provided with a slide fastener. There are two methods of releasing this slide fastener. Under ordinary circumstances, pull the

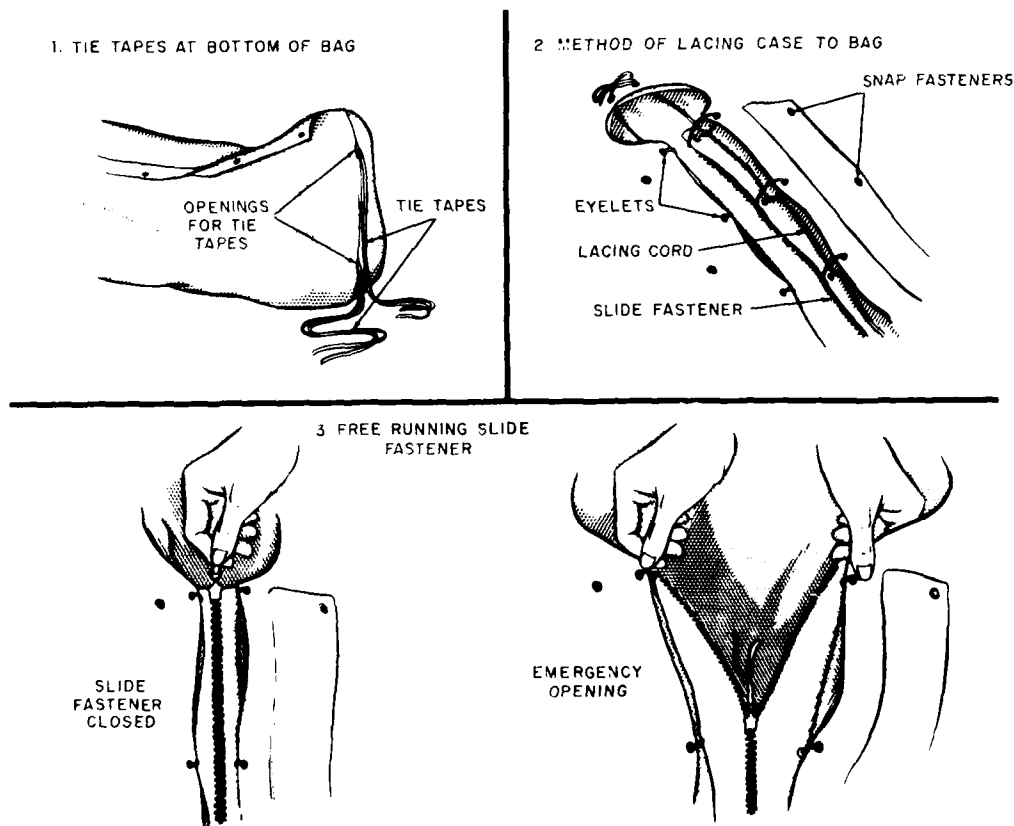


Figure 2-32.—Adjustments to sleeping bag and sleeping bag case.

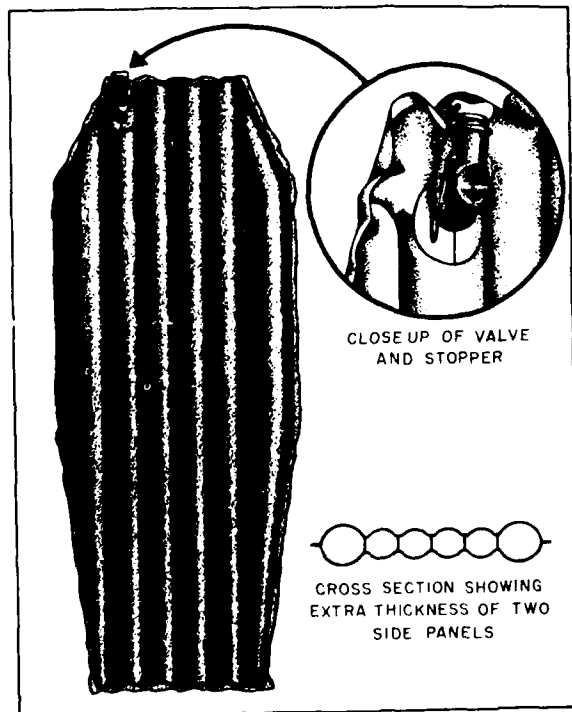
187.25

slide fastener slider down to release it. In an emergency, pull the slider up to the very top. (See fig. 2-32). This releases the slide fastener immediately along its entire length. To close the slide fastener after opening it in this manner, run the slider down to the bottom of the track, thread it into the other side, and pull it up again. Be sure that both sides of the track are close together before closing. Use the side fastener quick-release feature only in an emergency. Rethreading the fastener requires time and is difficult to do with cold fingers.

To pack the sleeping bag, place it directly into the waterproof clothing bag, then roll it from the top to the bottom into a small bundle and tie with the tie tapes provided at the bottom. Always carry the sleeping bag inside its waterproof case.

SLEEPING MAT

The sleeping mat (fig. 2-33) is made of a coated fabric and shaped to conform in general



187.26

Figure 2-33.—Sleeping mat.

to the sleeping bag. You should use the mattress under the sleeping equipment for added warmth and comfort and to keep your equipment clean and dry. Test the mattress for proper inflation by sitting on it. It is properly inflated when your buttocks barely touch the ground. Always inflate the mattress by blowing into it. Do not use air lines or other mechanical means.

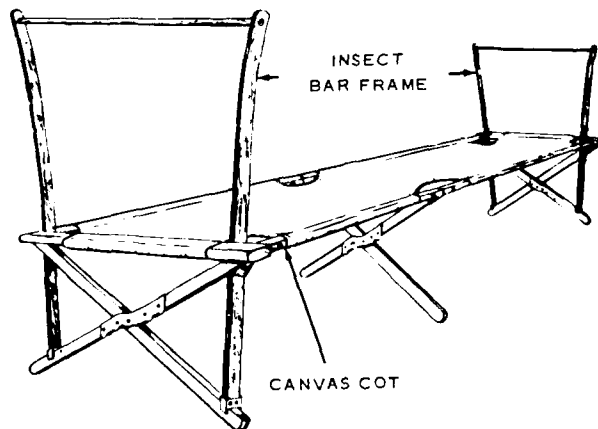
When possible, air-dry the mattress before packing it away. Always roll the mattress towards the open valve to release the air. Place the mattress on the sleeping equipment and roll them together or roll the mattress separately and put it in or attach it to your field pack.

CANVAS COT AND INSECT BAR FRAME

The collapsible canvas cot has three sets of fold nets. The insect bar frame is made of wood and consists of four upright members which are fitted to the bottom of the end cot legs by steel clips (fig. 2-34).

INSECT BAR

The field-type insect bar is a canopy made from netting of small nylon mesh. It protects you against mosquitoes, sandflies, and other small insects. The bar may be used with the canvas cot by attaching a wooden insect bar frame to each



187.27

Figure 2-34.—Canvas cot and insect bar frame.

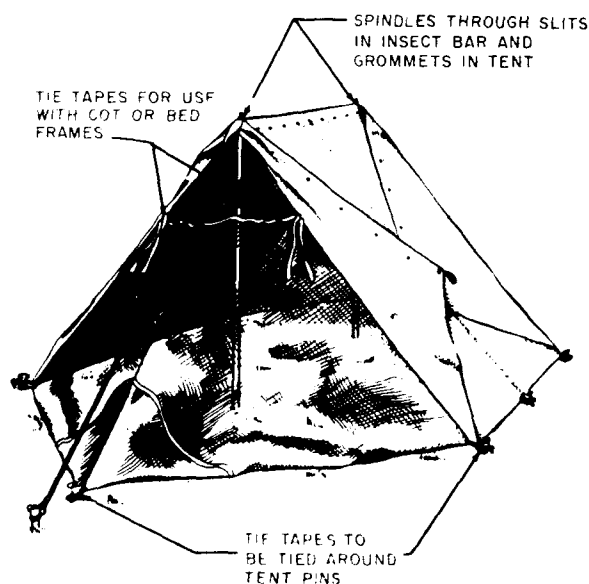
end of the cot and tying the tie tapes of the net to the top corners of each frame. The net may also be used with the shelter half tent, as shown in figure 2-35, or it may be suspended from trees or bushes. The insect net may be folded in a small bundle and carried in the field pack.

THE CAMOUFLAGE BAND

The camouflage helmet band is an elastic band which may be fitted around the helmet at the base above the rim. The band is used to hold a camouflage head net or other camouflage material, such as foliage, in place.

GENERAL CARE AND MAINTENANCE OF CLOTHING AND EQUIPMENT

You are responsible for the care and maintenance of the clothing and equipment issued or sold to you. It is your duty to see that these items are available and in serviceable condition when they are needed.



187.28

Figure 2-35.—Using field-type insect bar with shelter half tent.

General instructions for cleaning, pressing, storing, mending, and maintaining items of your uniform and equipment are given in the following sections.

CLEANING CLOTHING

Brush clothing frequently and, whenever possible, outdoors in the sunlight. Always brush and sun clothing before it is stored and when it is unpacked after storage. Clean clothing regularly when it is not in use. Dirty clothing wears out rapidly because the dirt cuts textile fibers and retains moisture from perspiration. Observe the following instructions:

1. Wash cotton clothing, such as shirts, trousers, and socks with soap or synthetic detergents in hot water.
2. Wash untailored wool clothing, such as socks and glove inserts, in mild soap or synthetic detergents with lukewarm or cool water. Never use hot or boiling water. Stretch them into shape while drying.
3. Dry-clean all tailored wool clothing, such as your wool jackets and blues. Washing affects their tailored features.
4. Remove stains or soil as soon as possible as the longer they remain the harder it is to get them out.
5. Wipe coated clothing, such as ponchos and raincoats, with a clean cloth and wash with water and mild soap or synthetic detergent. Do NOT use cleaning fluid on coated fabrics.
6. Wash synthetic fabrics, such as stretch-type socks, in mild soap or synthetic detergent, using lukewarm or cool water.

PRESSING CLOTHING

Press clothing after it has been cleaned and all spots removed. Never press dirty clothing. Observe the following instructions when pressing:

1. Make certain the iron is not too hot. Use the temperature settings on the iron as required for the type of clothing being pressed.
2. Use a damp cloth between the iron and the fabric when pressing wool clothing.
3. Dampen the surface of cotton clothing and apply the iron directly to it; if a steam iron is used, dampening is not required.

STORING CLOTHING

Observe the following instructions when storing clothing:

1. Make certain the clothing is clean.
2. Brush, sun, and air-dry all wool and cotton clothing before storing to avoid mildew in humid weather. Do not fold clothing when wet or place wet clothing in a bag or pack. Use naphthalene or mothballs to protect wool clothing from insects.
3. Make certain that coated clothing is cool and dry before folding it for storage. When possible, fold it so that a coated side will be against an uncoated side to avoid sticking. If possible, dust coated clothing with talcum before storing.

REPLACING BUTTONS

Observe the following instructions when replacing buttons:

1. First thread the needle and tie the two ends of the thread together.
2. Put the needle through the cloth and stitch several times to anchor the end of the thread.
3. Next, put the needle through the button and allow it to slide down the thread.
4. Stitch through the cloth and the holes, first on one side then the other. Hold the button away from the cloth just a little to help prevent strain on the cloth.
5. After sewing, wrap a few turns of thread around the stitches between the button and cloth. Finish up by stitching through the wrapped thread a number of times and locking the stitches with a knot.

REPAIRING RIPS AND TEARS

To mend a ripped seam, place the two edges together and sew, keeping the stitches small and in line with those already made. To mend a tear, place the two edges on the wrong (or inside) side and sew together. To mend a frayed edge, turn the edge under and sew.

BOOTS AND SHOES

A new pair of boots or shoes should not be fitted too snugly with the expectation that they will stretch. They should fit properly when new. Whenever possible, wear one pair one day and another pair the next to allow them to dry between wearings. In cleaning boots, scrape dirt or mud away with a flat stick, brush, or anything dull that will not cut the leather. Using a small handbrush, wash with mild soap and very little water. Remove all the soapsuds, and wipe the inside dry with a clean cloth. Stuff paper in the toes while the boots or shoes are still wet to keep the leather from shrinking out of shape. Dry the boots or shoes slowly in a warm, dry place. Do not dry by exposure to hot sun, fire, or other strong heat, because it may injure the rubber or leather. Be sure that boots or shoes are replaced or repaired when they show signs of excess wear. Don't wait. A pair of shoes which is not in good repair can cause severe discomfort and lessen your effectiveness, so take care of them.

CANVAS EQUIPMENT

Clean canvas equipment, such as bags and packs, by dipping them vigorously in a pail of water containing mild soap or detergent. Do not scrub them with a stiff brush as this will damage the material. Dry canvas items in the shade or indoors. NEVER wash or dry canvas items in automatic machines. Always repair small rips and tears as soon as possible.

WEB EQUIPMENT

Clean web equipment in the same manner as canvas. NEVER use chlorine, yellow issue soap, cleaning fluids, or dyes. Don't attempt to dye or repair web equipment. If it is old or damaged, turn it in for replacement.

NETTING

Wash netting with a warm solution of mild soap or detergent. Repair small holes or tears by placing pieces of adhesive tape or waterproof tape over both sides of the hole. In an emergency, draw the edges together and tie with string.

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FASTENERS

Always use care in opening snap fasteners. To open, place the thumb and forefinger between the two layers of cloth close to the fastener and pry apart. Do not tug at the cloth.

A slide fastener, even of sturdy construction, must be used carefully. When it snags, check it to see what is wrong. Don't try to force it. Usually by backing it up, smoothing it out, and trying again, it will work. If it works stiffly, rub a thin coating of wax or lead pencil graphite on each side of the track and then work it back and forth a few times.

COATED ITEMS

Wipe soiled items with a clean cloth, wash with water and a mild soap or detergent, and rinse thoroughly. Dry the items as quickly as possible, but do not use direct heat as the material will dry out and crack. Take special care to see that such substances as grease, oil, acid, or insect repellent are washed off as soon as possible.

ARMOR VEST

General instructions for taking care of the armor vest are usually sewn inside it near the

collar. Observe these instructions carefully. NEVER dry the armor vest over or near an open flame.

SEABAG AND 782 GEAR LAYOUT

COMCBPAC and COMCBLANT have agreed on a 782 gear layout for the NCF. A standard layout consists of the items indicated in table 2-1. Requirements may change with your command's mission. Also, an environmental condition change may require a modification to the layout. When changes occur, local commands will direct the 782 gear layout procedures.

For a rifleman, the standard bunk layout is displayed in figure 2-36 and the poncho layout in figure 2-37. Personnel assigned a service pistol will use the bunk layout displayed in figure 2-38 and the poncho layout shown in figure 2-39.

The seabag layout is standard according to COMCBPAC/COMCBLANTINST 1020.2A. A home port layout (fig. 2-40) and a deployed layout (fig. 2-41) are covered by this same instruction. Table 2-2 is a listing of deployed NMCB minimum uniform requirements for personnel in paygrades E-1 through E-6. Your command may require additional uniform items that are not on this list.

Chapter 2—SPECIAL CLOTHING AND EQUIPMENT

Table 2-1.—782 Gear Layout Items

Poncho
Camouflaged Helmet Cover/Mounted on Helmet
Utility Cover
Identification Tags
Identification Card
Field Protective Mask Carrier
Field Protective Mask
Trousers (Display two)
Towel
Soap/Toothbrush/Toothpaste/Razor/Razor Blades/Shaving Lather (Displayed on towel)
Shelter Half
Tent Pole (Three sections)
Tent Pins (Display five)
Guy Line
Shirts (Display two)
Shaving Kit Bag
Sewing Kit
Foot Powder
Boot Polish
Brush
Entrenching Tool Cover
Entrenching Tool
Undershirts Green (Display two) Stenciled
Undershorts White (Display two) Stenciled
Web Belt
*M-16 Magazine Pouch
*M-16 Magazine (Display two)
*M-16 Magazine Pouch
Canteen Cup
Canteen Cover
Canteen
Socks Green Stenciled (Display four)
First Aid Kit
Mess Gear (Display knife, fork, spoon)
Field Jacket
Alice Pack
Suspenders

*When authorized to wear .45 cal pistol, display .45 cal magazine pouch, two magazines, and pistol holster.

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Table 2-2.—Deployed NMCB Uniform Requirements For Men, E1-E6

<u>ITEM</u>	<u>QUANTITY</u>	
Bag, Duffel	1	
Belt, Web, Black, w/Silver Clip	2	
Belt, Web, White, w/Silver Clip	1	
Belt, Web, Black, w/Gold (Brass) Clip	1	
Boots, Combat	2 pr	
Buckle, Web Belt, Silver	2	
Buckle, Web Belt, USMC	1	
Cap, Utility, OG	3	
Coat, Field	1	
Liner, Field Coat	1	
Drawers, White	6	
Group Rate Mark, Black	3	
Group Rate Mark, White	4	
Hat, Hard Construction	1	R
Hat, White	2	R
Jumper, Blue Dress	1	
Jumper, White Dress	1	
Neckerchief	1	
Necktie, Black	1	
Shirt (Winter Blue)	1	
Shirt, White, Short Sleeves	1	
Shirt, Utility, OG	6	
Shoes, Dress Black	1 pr	
Socks, OG	6 pr	
Socks, Cotton/Nylon Black	2 pr	R
Towel, Bath	4	
Trousers, OG	6	
Trousers, Broadfall Blue	1 pr	
Trousers, (Dress Blue)	1 pr	
Trousers, (White)	1 pr	
Trousers, White Jumper (Polyester)	1 pr	
Undershirts	6	

NOTE: The above seabag is the minimum requirement established by CBPAC/CBLANT for deployed units. Commanding officers may require additional items commensurate with environmental conditions at deployed sites.

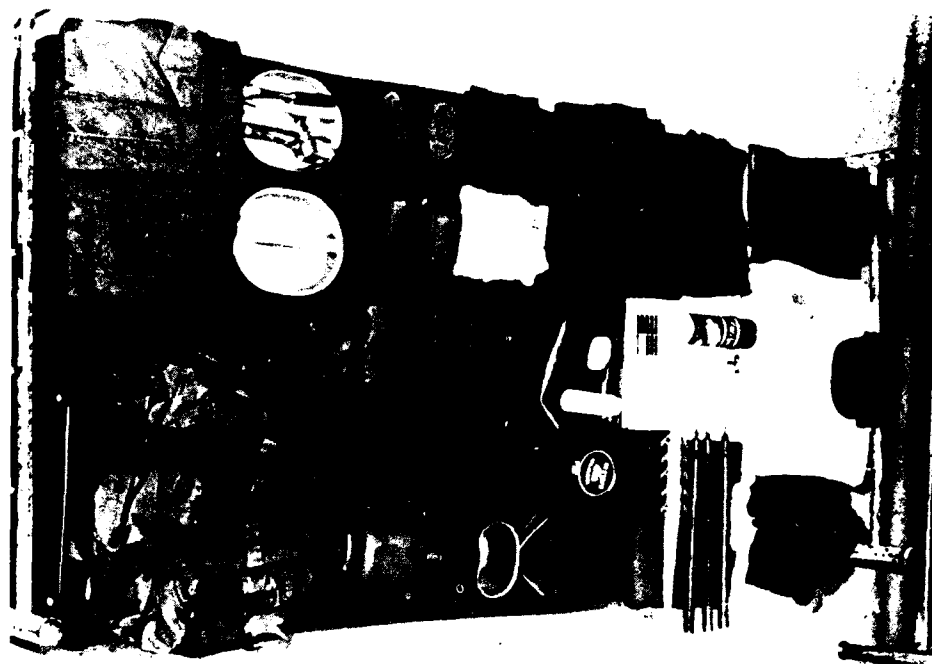


Figure 2-36.—Bunk layout—Rifleman.

187.1

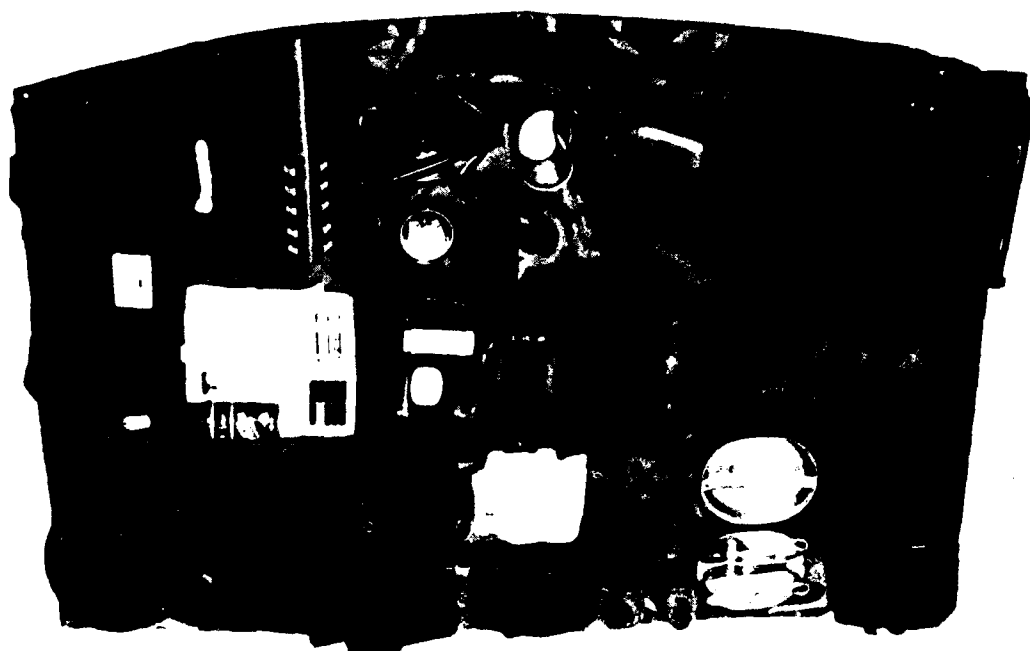
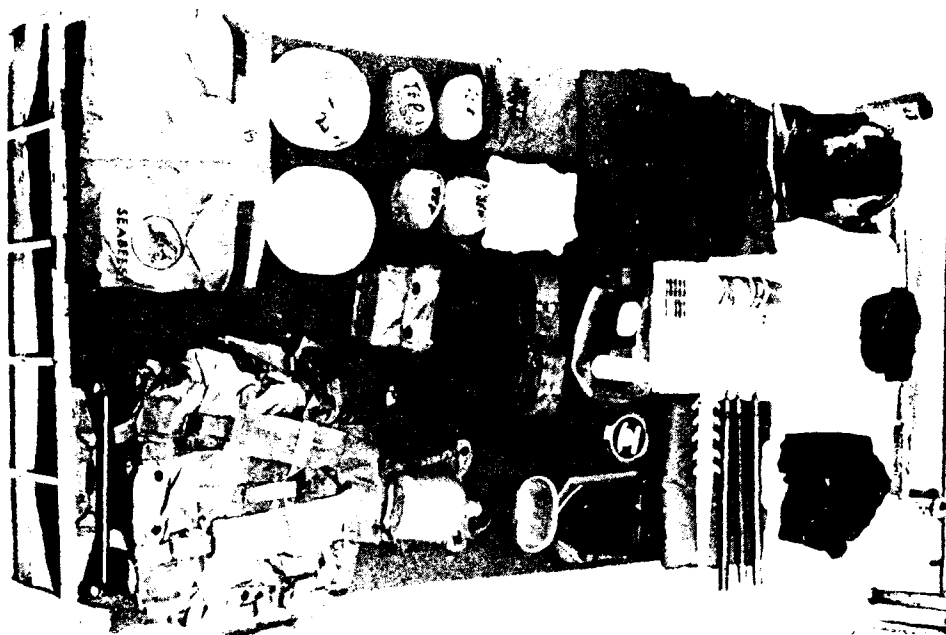


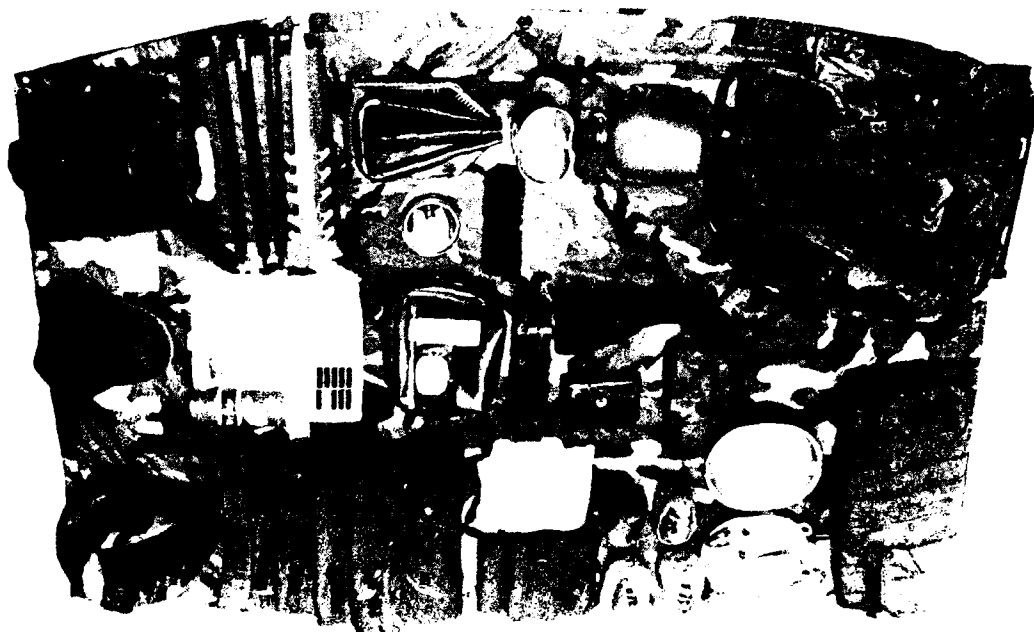
Figure 2-37.—Poncho layout—Rifleman.

187.1A



187.1B

Figure 2-38.—Bunk layout with service pistol.



187.1C

Figure 2-39.—Poncho layout with service pistol.

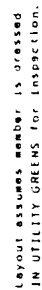


Figure 2-40.—Scabee seabag layout (home port).

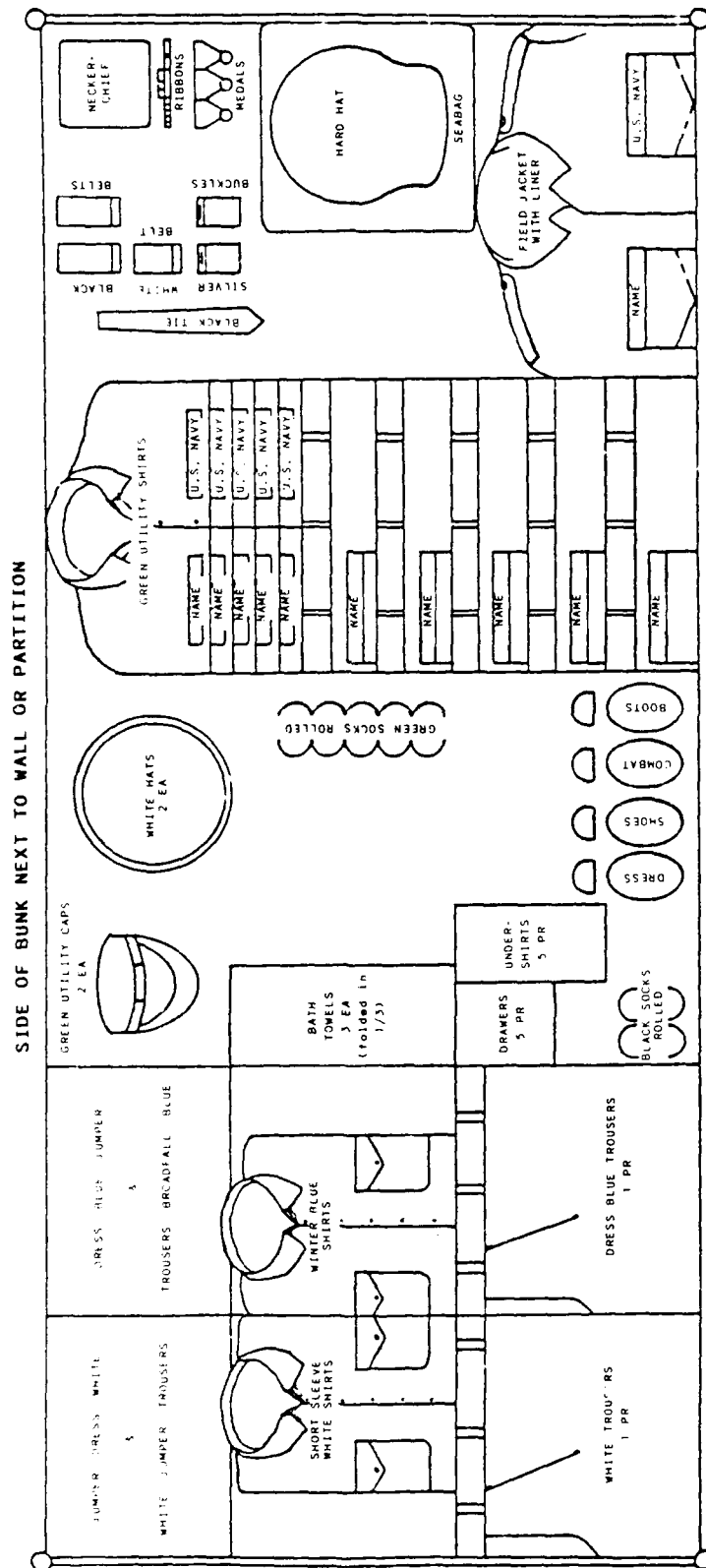


Figure 2-41.—Seabee seabag layout (deployed).

CHAPTER 3

LEADERSHIP AND PHYSICAL FITNESS

Supervision or leadership is an art. It requires the ability to organize, delegate, and coordinate operations—techniques, that you, as the supervisor, should employ in your daily supervisory activities. Learning how to organize, delegate, and coordinate the various phases of a mission can be developed the same way as any other art. The art of military leadership can be learned, developed, and practiced in varying degrees by anyone motivated sufficiently who has the mental and physical ability and the moral integrity expected of either a commissioned officer or petty officer. You have probably heard the expression “leaders are born, not made,” or someone may say, “that person is a born leader.” You can forget those terms. There is no such thing as a born leader. Many people seem to be natural leaders because they have a strong, magnetic personality, or they may have a natural ability to learn rapidly. However, those people are the exception rather than the rule. Because leaders are not “born” they must be trained. Developing this art is a continuing process.

The ultimate objective of a supervisor is the successful accomplishment of an assigned task or mission. When properly supervised, this task or mission is carried out with a minimum expenditure of manpower and materials. Also, it is done with a maximum of harmony, cooperation, and efficiency within the entire unit—from the unskilled troops to the management and command levels of an organization.

LEADERSHIP TERMS

In military as well as in civilian usage, the functions of command, management, and leadership become a question of interpretation because

of their interrelationship. To enable each leader to begin the study of leadership with a common foundation, it is necessary to understand these terms, their definitions, and their relationship in the Navy.

COMMAND

COMMAND IS THE AUTHORITY A PERSON IN THE MILITARY SERVICE LAWFULLY EXERCISES OVER SUBORDINATES BY VIRTUE OF HIS RANK AND ASSIGNMENT OR POSITION.

What does this mean to the officer or noncommissioned officer? It provides the legal basis for exercise of the broad activities of leadership and management and derives from the position to which he is assigned. **COMMAND** is primarily the authority delegated through the chain of command. **AUTHORITY** is the legitimate power of a leader to direct those subordinate to him or to take action within the scope of his position. **RESPONSIBILITY** is an integral part of the leader's authority. All **SEABEES** are morally and legally accountable for their actions. Additionally, leaders are responsible for exercising their authority to accomplish their mission.

The guidelines for the responsibility and authority exercised by officers, chief petty officers, and petty officers come from regulations, manuals, orders, and other directives; but these do not cover all situations. At times, a leader must decide on a course of action without the help of guidelines. In those situations, the guidelines for the commander or leader's authority are solely his ability to judge what is right. He then exercises

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responsibility and authority based on his personal judgment and experience.

What is the relationship of the leader to responsibility and authority? At all levels of command, the leader is responsible for what his men do, or fail to do, as well as for the physical assets of his unit. He is responsible down the chain of command for his subordinates and up the chain of command for mission accomplishment. He has the authority to direct his men's actions toward the accomplishment of missions assigned by superiors and to generate activities, such as training and maintenance, that will prepare his unit to do this successfully. However, the leader's responsibility and authority differ in degree, depending on his position. If the proportion of resources alone is considered, obviously with higher position, comes greater responsibility; and hence, the leader has more authority to meet this responsibility. Because of the Navy's system of advancement, the increase in responsibility and authority goes hand in hand with increased experience and higher rank or rate.

The commander is responsible for attainment of the numerous goals of his organization. To attain them, he must use good leadership techniques in dealing with his men and good management techniques in organizing and providing the resources necessary to accomplish the mission.

MANAGEMENT

MANAGEMENT IS THE PROCESS OF PLANNING, ORGANIZING, COORDINATING, DIRECTING, AND CONTROLLING RESOURCES, SUCH AS MEN, MATERIAL, TIME, AND MONEY, TO ACCOMPLISH THE ORGANIZATIONAL MISSION.

As can be seen from this definition, the commander is involved in all organizational activities. When a commander is unable to personally supervise each activity, he delegates his authority and, thereby, uses his subordinates to assist him in accomplishing the mission.

Of the resources available to the manager, men are the most important. This resource is the foundation for the employment of the other

resources. The manager uses leadership to control this critical resource.

LEADERSHIP

There are many definitions of the term "leadership." These definitions have two common elements: the accomplishment of a mission or task and the influence of one man, the leader, on another man or group of men. If these definitions are combined into one that directly applies to military leadership, we can say that:

MILITARY LEADERSHIP IS THE ART OF INFLUENCING PEOPLE TO PROCESS TOWARDS THE ACCOMPLISHMENT OF A SPECIFIC GOAL.

Leadership involves the personal relationship of one person to another—the ability of a supervisor to use his personality to directly influence his subordinates to accomplish a mission.

Ideally, the process of leadership results in the willing cooperation of subordinates through persuasion. Persuasion does not mean that the leader takes a vote to determine the unit's course of action or that his decision is open to argument from his subordinates. Persuasion means that, because of the leader's sound judgment, knowledge, and personal relationships with his men, he is able to direct his men's attitudes as well as their behavior toward the attainment of organizational goals. Because of the Navy's combat mission and the personalities of individual subordinates, persuasive leadership alone is not always effective or appropriate. It is sometimes necessary to apply a more authoritarian form of leadership in combination with persuasion.

How do leadership and management relate? At lower levels, leaders lead primarily through face-to-face dealings with their men. They are also managers, but a higher level within the chain of command controls most of the resources they use. For example, the squad leader devotes most of his efforts toward influencing people and only a small portion of his efforts toward managing materials and time.

As a leader moves up the chain of command, the size of his unit increases, but his direct influence on the actions of the unit decreases. For

example, it is difficult for a company commander to influence personally all of the men in his unit. He can, however, by working through his staff and subordinate leaders, influence his unit to accomplish the mission. He uses leadership in dealing with his subordinate leaders by personally influencing their actions. Through their actions he gets things done.

As a man gains a higher position, he increases the extent to which he must use all of the resources. For example, Alpha Company Commander is responsible for a large number of vehicles of various types. He cannot personally supervise all aspects of the maintenance program to ensure that the vehicles are combat ready. He can, however, by working through his maintenance supervisor and other subordinates, ensure that his vehicles are properly maintained. The company commander manages his vehicle resources through his chain of command and staff who, in turn, must supervise the mechanics and drivers who actually perform the maintenance. The company commander ensures that this is done by personal spot checks, reports, and inspections.

LEADERSHIP QUALITIES

The information and terms used in this chapter are basic leadership fundamentals. You will receive more detailed information when attending the Navy's Leadership and Management Education and Training (LMET) Program.

When a study of the personalities of a group of successful leaders was conducted some time ago, several qualities were identified as common to the group. Possession of these qualities by itself does not guarantee success; but apparently, they are most desirable in all leaders.

Although these qualities are a good guide for the desirable personality development of a leader, the mission, the personalities of subordinates, and the situation will have a direct effect on which qualities the leader must apply. They are not all-inclusive, but serve as those qualities that are most desirable in a military leader.

BEARING

A man's bearing is his general appearance, carriage, deportment, and conduct. The bearing

of the leader establishes the standard that affects subordinates, peers, and superiors. His carriage should be upright, his general appearance, and the condition of his clothing and equipment exemplary. His appearance and manner should reflect alertness, energy, competence, and confidence. Through the control of voice and gestures, he can exert a firm and steadying influence over those around him. Few things can steady the morale of troops more than the realization that their leader, with full knowledge of the difficulties of a situation, neither looks nor acts worried. Good leaders know that their apparent confidence in themselves, their troops, the equipment, and the outcome of a situation has a positive effect on their men.

Frequent irritation, loss of temper, and vulgar speech indicates a lack of self-control or self-discipline. A leader who cannot control himself cannot expect to control others. The job of a leader frequently requires that he make verbal corrections. To use profane or obscene language or to talk down to subordinates, especially when giving orders, risks friction, resentment, quarreling, and even insubordination. Men resent being sworn at by their leaders. They feel, and rightly so, that immoderate language is more often an expression of anger directed at them.

Avoid verbal condemnation of an entire group. It is unlikely that the leader will have an entire unit that deserves wholesale reprimand or punishment. The resentment created in subordinates who are unfairly included in mass disciplinary actions makes this an unsound practice.

Like profanity, sarcasm and irony often leave men in doubt about exactly what the leader means. Even a bantering tone should not be used often. The SEABEE is often too accustomed to wisecracking to resist replying in the same manner when he is on the receiving end of such remarks. However, any wise leader will know that in some circumstances a certain amount of joking is helpful. During periods of exhaustion and discouragement, humor may impart confidence or relieve tension. Often, humor is well received as a means of implying sympathy and understanding or cooperation in the midst of difficulty. This method is very effective when employed by those leaders who display great dignity.

Dignity is also an essential element in the leader's bearing that should not be overlooked. It implies a state of being honorable and requires the control of one's actions and emotions. A leader who makes a spectacle of himself through loudness, drink, or drugs quickly loses the respect of his men. To develop good bearing, a leader should concentrate on achieving and maintaining the highest standards in appearance and conduct.

COURAGE

Courage is a mental quality that recognizes fear of danger or criticism but enables a man to proceed in the face of it with calmness and firmness. It is a quality of mind that gives a man control over fear, enabling him to accept responsibility and act properly in a threatening situation. Courage exists in a moral as well as a physical sense. Moral courage means knowing and standing up for what is right in the face of popular disfavor. A leader who has moral courage will admit his errors but will enforce his decisions when he is sure he is correct. To help attain and demonstrate courage, the leader should study and understand his reactions to fear and control his fear by developing self-discipline and calmness. He must be orderly in his thought process and take care not to exaggerate adversity. He must stand for what is right in the face of popular disagreement and accept blame when he is at fault.

DECISIVENESS

The leader should be able to make decisions promptly and to state them in a clear, forceful manner. Many situations have more than one solution. The wise leader gets all the facts, weighs one against the other, then calmly and quickly arrives at a sound decision. Decisiveness is largely a matter of practice and experience. The leader should also keep in mind that many sound ideas originate at the subordinate level. He should solicit opinions of his subordinates when appropriate. A positive approach, little waste of time, objectivity, timely analysis, and sound evaluations of opinions made by others all contribute to the development of decisiveness in the leader.

DEPENDABILITY

Dependability, the certainty of proper performance of duty, is a quality the leader must develop. A dependable leader can be relied upon to carry out any activity with willing effort. This willing and voluntary support of the policies and orders of the chain of command does not mean blind obedience. Most commanders will listen to the suggestions of their subordinates; but once the commander makes the final decision, the subordinate must give it his complete and energetic support.

The leader who has a high sense of duty will continually put forth his best efforts in an attempt to achieve the highest standards of performance. He will also subordinate personal interest to military requirements.

ENDURANCE

Endurance, the mental and physical stamina measured by the ability to withstand pain, fatigue, stress, and hardship, is akin to courage. It is an important quality of leadership that leaders must have if they are to merit the proper respect from subordinates. Subordinates may view a lack of endurance in a combat situation as cowardice. Likewise, the leader's lack of endurance makes him a liability rather than the asset he should be. The leader sets the standards for a unit most effectively by example. The leader must display an acceptable, if not superior, level of endurance. He may develop his endurance and stamina by regular participation in strenuous physical and mental activities. Frequent self-administered tests can give the leader a measure of his endurance level. Self-discipline and fortitude are essential in developing and maintaining endurance.

ENTHUSIASM

Enthusiasm is the display of sincere interest and zeal in the performance of duties. This requires the leader to be optimistic and cheerful. The leader must, therefore, willingly accept the challenges of his profession and determine to do the best job possible. This attitude, when developed, helps create a good unit. Whether in training or combat, enthusiastic troops are essential in accomplishing the mission. A most

important step in instilling enthusiasm in men is explaining the "Why" of the leader's actions. If SEABEES believe in and understand a mission, they usually do their best to accomplish it. To avoid becoming stale, set aside a brief period daily to relax. Capitalize on success. Enthusiasm is contagious, and nothing will develop it more than the success of a unit or an individual.

INITIATIVE

Initiative, or taking action in the absence of orders, is often required of leaders. Men develop respect and trust for a leader who meets new and unexpected situations with prompt action. One way to encourage initiative in men is to assign them tasks commensurate with their grade and experience level. This allows them to work out the details and complete the tasks. This method frees the leader from a number of details so that he can devote more time to monitoring the activities for which he is responsible. Closely associated with initiative is resourcefulness, the ability to deal with a situation in the absence of normal resources or methods. Under stressful conditions, the unexpected is often encountered. In these situations, failing to act cannot be excused. When normal resources do not support a situation, another method must be found to solve the problem.

The ability to anticipate future unit missions is also important. A leader who spends much of his time reacting to situations or "putting out fires" rather than anticipating and planning ahead often finds himself unable to lead his unit efficiently.

Caution, judgment, and discretion must be used in reaching decisions. To aid development of initiative, stay alert, try to recognize the task that needs to be done, and then do it. Use available resources efficiently.

INTEGRITY

The uprightness and soundness of moral principles, the quality of truthfulness, and honesty describe integrity. In the military, the lives of thousands are placed in the hands of a few leaders. These leaders must have unquestionable integrity. Honesty, sense of duty, and moral principles must be placed above all else. Reports from the small

unit leader to the highest headquarters must contain true facts because the seemingly unimportant report might have great effect. Sound estimation and planning at high levels are impossible without accurate information supplied throughout the chain of command. A leader who proves himself unreliable or of questionable integrity has no place in the military.

JUDGMENT

Judgment is the ability to logically weigh facts and possible solutions on which to base sound decisions. Anticipation of situations, avoidance of hasty decisions, and the application of common sense will ensure success in most situations that confront the leader.

Technical knowledge plays an important role in many judgment situations. The lack of technical expertise in a given situation may turn what would ordinarily be a sound decision into a disaster. The leader who always appears to make sound decisions is the one who has personal knowledge or the presence of mind to confer with experts about those subjects in which he lacks knowledge. Often, a sign of good judgment is knowing when to ask a question. Many inexperienced leaders fall victim to the old saying, "If you ask a silly question, you'll get a silly answer." It would be more correct to adhere to the saying, "The only silly question is the question not asked."

JUSTICE

The military leader gives reward and punishment according to the merits of the case in question. Impartiality is necessary in all situations requiring a judgment. Prejudice of any kind cannot be accepted. Each decision made by a leader about reward or punishment is a test of fairness that is observed by subordinates and superiors alike. A careless mistake in judgment can destroy a reputation of fairness that took months to establish. When confronted with a situation requiring justice, the leader must be fair, consistent, and prompt. In instances involving discipline, individual consideration must be given in each case. Although cases may appear similar, no two are exactly alike. The persons, situation, and circumstances are peculiar to each case. In

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some situations, mass punishment may appear to be the answer. Even in the case where guilt is obvious in each member of the group, each individual should still be dealt with separately.

Justice also has a positive effect in the form of awards and decorations. The effective leader does not fail to recognize subordinates who are worthy of commendation or award. The leader who uses nothing but punishment will destroy his unit's morale. However, the leader who establishes favorites is just as destructive to unit morale as the one who only punishes.

KNOWLEDGE

The leader should develop a program of learning to keep himself abreast of current developments in his military specialty, command policies, and his local and world communities. Field manuals, training directives, situation reports, magazines, newspapers, and periodicals are valuable aids toward this goal. Serious discussion, research, and experience also contribute to broadening the leader's knowledge.

LOYALTY

Loyalty is the quality of faithfulness to our country, the Navy, seniors, subordinates, and peers. The confidence and respect that loyalty gain from superiors and subordinates is immeasurable. Conversely, the damage resulting from a lack of loyalty is measurable. Respect for a leader's reputation spreads far and wide when based on his actions to protect his subordinates from abuse. Yet, that same leader can lose that respect by discussing with inappropriate individuals a subordinate's personal problem which he has learned about during a counseling session. Loyalty to a commander is often erroneously viewed as indicative of being a "Yes Man." Total agreement with every order is seldom experienced throughout a military career. The good leader does not allow his personal opinion to interfere with his mission nor does he give the impression of disagreement with orders when relaying them to his men. He views his orders as his superior's method of dealing with the situation and supports them wholeheartedly. As a leader, it is important to have every action reflect loyalty to the United

States, the Navy, superiors, the unit, and subordinates.

TACT

Tact is the ability to deal with others in a respectful manner. The leader who displays tact in dealing with superiors and subordinates encourages courteous treatment in return. Usually, this practice is not difficult. During conditions of stress or when a subordinate is criticized, the use of tact becomes more challenging. To demand courtesy and to fail to return it indicates lack of respect. The inexperienced leader sometimes feels politeness in the military implies softness. Unfortunately, some men wrongly consider courtesy to a superior as "brown nosing" or "bootlicking." Usually a calm, courteous, firm approach will bring cooperative response without creating ill feeling. Abrupt and forceful orders may be desirable in emergencies because of the time saved and the seriousness of the situation. There are other situations that require forcefulness of tone and action; but even then, there is no reason for discourtesy.

UNSELFISHNESS

The unselfish leader is one who avoids providing for his own comfort and personal advancement at the expense of others. The comfort, pleasure, and recreation of subordinates should be placed before that of leaders. It is difficult to respect a leader who seeks his own comfort over that of his men or who hoards credit for achievement made possible by subordinates. The true leader places himself last in priority and shares the dangers and hardships with his men.

SEABEE LEADERSHIP PRINCIPLES

These qualities of leadership mean little alone unless applied in an effective manner. The principles of leadership can assist in applying them.

These principles have stood the test of time and have guided the conduct and action of successful leaders of the past. Throughout history, the principles of leadership have, in varying

degrees, influenced the actions of every successful leader. The fact that every leader has not always made full use of each one of these principles does not make them any less valid. Although their application may vary with the situation, a leader who disregards them risks failure. The following guidelines are the principles of SEABEE leadership.

1. Know yourself and seek self-improvement.
2. Be technically and tactically proficient.
3. Seek responsibility and take responsibility for your actions.
4. Make sound and timely decisions.
5. Set the example.
6. Know your men and look out for their welfare.
7. Keep your men informed.
8. Develop a sense of responsibility in your subordinates.
9. Ensure that the task is understood, supervised, and accomplished.
10. Train your men as a team.
11. Employ your unit in accordance with its capabilities.

The principles of leadership guide all leaders. This guidance is not new. It is based on a commonsense approach to accomplishing the mission. If the leader understands the principles and recognizes the necessity for a working knowledge of human behavior in order to apply these principles, he will have the basic tools to be an effective leader.

Although the principles are still valid, their use requires reexamination by each leader so that he may best apply them and because some principles have added significance because of the nature of today's SEABEE.

KNOW YOURSELF AND SEEK SELF-IMPROVEMENT

Honest self-evaluation to determine his own strengths and weaknesses is of paramount importance to a leader. Through this process he can determine his capabilities and limitations. Additionally, through knowledge of himself, combined with his knowledge of individual and group behavior, the leader is able to evaluate how

his actions and behavior affect his subordinates and their behavior. This process also gives a leader the knowledge necessary to develop his strengths and to strengthen his weaknesses further.

Some techniques for applying this principle are the following.

- Analyze yourself objectively to determine your strong and weak personal qualities. Strive to overcome the weak ones and further strengthen those in which you are strong.
- Solicit, when appropriate, the honest opinions of your contemporaries or superiors about how you can improve your leadership ability.
- Profit by studying the causes for the success or failure of other leaders, past and present.
- Develop a genuine interest in people; acquire the human touch.
- Master the art of effective writing and speaking.
- Cultivate friendly relations with members of the other armed services and with civilians.
- Develop a philosophy of life and of work. Have a definite goal and a plan to attain it.

BE TECHNICALLY AND TACTICALLY PROFICIENT

A leader must demonstrate to his men that he is well qualified to lead his unit. He must be competent in combat operations and training as well as in the technical and administrative aspects of his duties. Today's SEABEE expects answers to his questions. Rank and position alone will not automatically gain his respect and confidence. The leader must demonstrate his proficiency to get his men's respect and confidence. If the leader is deficient in carrying out his duties, his men will lose confidence in his ability and in the effectiveness of their unit.

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The application of this principle can be enhanced through the use of the following techniques.

- Seek a well-rounded military education by supplementing attendance at service schools with independent reading, research, and study.

- Seek out and foster association with capable leaders. Observe and study their actions.

- Broaden your knowledge through association with members of the other armed services.

- Seek opportunities to apply your knowledge through the exercise of command. Good leadership is acquired only through practice.

- Keep abreast of current military developments.

- By study and through frequent contact with subordinates, familiarize yourself with the capabilities and limitations of all elements of your command.

- Prepare yourself for the job of leader at the next higher echelon.

- Learn and apply sound leadership and management principles and techniques.

SEEK RESPONSIBILITY AND TAKE RESPONSIBILITY FOR YOUR ACTIONS

Armed with the knowledge gained from honest self-evaluation and with the sound technical and tactical foundation required to perform his job, the leader must take the initiative to accomplish his unit's mission. By seeking responsibility, he develops himself professionally and increases his leadership ability. Accepting the responsibility for all that his unit does, or fails to do, is part of the leader's job. In the absence of orders, seizing the initiative and taking the necessary action based on personal judgment and experience will aid in accomplishing the mission. Constant study, training, and proper planning will lay the groundwork for the competence needed

for the sound and timely decisions that form the basis for the leader's actions.

The following techniques may be used to assist in applying the principle of seeking and taking responsibility for your actions.

- Learn the duties of your immediate senior and be prepared to accept his responsibilities.

- Seek diversified leadership positions that will give you experience in accepting responsibility.

- Take every opportunity that offers increased responsibility.

- Perform every act, large or small, to the best of your ability. Your reward will be increased opportunity to perform bigger and more important tasks.

- Accept just criticism and admit mistakes.

- Adhere to what you think is right; have the courage of your convictions.

- Carefully evaluate a subordinate's failure before taking action. Make sure his apparent shortcomings are not caused by an error on your part. Consider the manpower available, salvage a man if possible, and replace him when necessary.

- In the absence of orders, seize the initiative and take the action you believe your senior would direct if he were present.

MAKE SOUND AND TIMELY DECISIONS

The leader must be able to make a rapid estimate of the situation and arrive at a sound decision. He must be able to reason under the most trying conditions and decide quickly what action is necessary to take advantage of opportunities as they occur. The indecisive leader is unable to employ his unit well. He also creates hesitancy, loss of confidence, and confusion within his unit. When circumstances dictate a change of plans, prompt reaction builds the men's confidence in their leader.

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The following techniques can assist the leader in applying the principle of making sound and timely decisions.

- Develop a logical and orderly thought process by constant practice in making objective estimates of the situation.

- When time and the situation permit, plan for every possible event that reasonably can be foreseen.

- Consider the advice and suggestions of your subordinates, when possible, before making decisions.

- Announce decisions in time to allow subordinates to make necessary plans.

- Encourage cooperative estimates and planning in your unit.

- Make sure your men are familiar with your policies and plans.

- Consider the effects of your decisions on all members of your unit.

SET THE EXAMPLE

A leader must be a good example for his men in integrity, courage, administrative knowledge, professional competence, personal appearance, and personal conduct. Moreover, he must set the personal and professional standards for his organization by his performance. If he appears in an unfavorable light, the mutual confidence and respect that must exist between himself and his men may be destroyed.

Some of the following techniques are helpful in applying the principle of setting the example for your men.

- Be physically fit, well groomed, and correctly dressed.

- Master your emotions. The leader who is subject to uncontrolled bursts of anger or to periods of depression will be less effective as a leader.

- Maintain an optimistic outlook. Develop the will to win by capitalizing on your unit's capabilities. The more difficult the situation, the more you must display an attitude of calmness and confidence.

- Conduct yourself so that your personal habits are not open to censure.

- Exercise initiative and promote the spirit of initiative in your subordinates.

- Be loyal to your seniors and subordinates. Support the lawful policies of senior officers whether you personally agree with them or not. Loyalty is a two-way street.

- Avoid being partial to any subordinate.

- Be morally courageous. Establish principles and stand by them.

- Share danger and hardship with your men to demonstrate your willingness to assume your share of the difficulties.

- By your performance, develop conviction within your men that you are the best man for the position you hold.

- Delegate responsibility and authority in order to develop more leadership ability.

- Strive for professional competence.

KNOW YOUR MEN AND LOOK OUT FOR THEIR WELFARE

Of equal importance to understanding himself, the leader must know and understand his men. Just knowing their names, marital status, hometown, and other such data is not enough. The leader must understand what makes his men tick—their values, ideals, attitudes. In short, he must know why they act as they do. The leader must therefore observe, become personally acquainted with, and recognize his men as individuals who have different backgrounds and different personalities. Each leader must have a knowledge of individual and group behavior

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because without such knowledge he cannot understand the "why" of his men's actions.

Your men's desires to satisfy their own physical and learned needs is the basis for their behavior. Whether or not they put forth their best efforts in the performance of duty depends on the fulfillment of these needs. If you know your men and provide for their physical needs (for example, food, water, shelter) and help them to satisfy their learned needs (for example, safety, belonging, esteem, self-fulfillment), you will foster individual productivity and unit proficiency. When men know you are concerned with their welfare, they will have an attitude that enables them to accomplish their unit's goals.

By using these techniques, the leader can improve his application of the principle of knowing his men and looking out for their welfare.

- See the members of your command and let them see you; be friendly and approachable.
- Develop a knowledge and understanding of your subordinates.
- Concern yourself with the living conditions of the members of your unit.
- Help your men get needed support from available personal services.
- Provide for the spiritual welfare of your command by supporting religious activities.
- Protect the health of your unit by active supervision of hygiene and sanitation.
- Support a safety program actively.
- Determine what your unit's mental attitude is.
- Administer justice timely, fairly, and impartially.
- Ensure fair and equitable distribution of rewards.
- Encourage individual development.

- Provide sufficient athletic and recreational facilities and supplies, and ensure that your unit is receiving its share of quotas for recreation areas and entertainment benefits.
- Share the hardships of your men so you can better understand their reactions.

KEEP YOUR MEN INFORMED

By keeping your men well-informed, you will encourage initiative, improve teamwork, and enhance morale. In the past, SEABEES did not expect to be told why they were required to perform tasks. They accepted the fact that their leaders deemed it necessary, and they performed as required. Today's SEABEE, however, has grown up in a society whose widespread communications media give him added knowledge and an awareness of what goes on around him. Moreover, he has been taught in school to look for the logic in things, to think for himself, and to question things that do not make sense to him. Therefore, he expects to be kept informed and, when possible, to be given the reason for a particular requirement. Otherwise, he may become frustrated and will not perform well. The well-informed SEABEE has a better attitude toward the leader and the unit and will, therefore, be a better SEABEE. Additionally, subordinate leaders are kept abreast of the situation and, in your absence, will be able to make sound decisions based on the same reasoning. Because the subordinate understands the mission and his role in accomplishing it, he can establish a personal goal that is related to the organizational goal and adjust his behavior accordingly. However, a leader will not be able to give his men the reasons for every task because he may not know them or there may not be time to explain. If the men understand that their leader will, when feasible, explain the logic or reasons behind each order, they will be conditioned to react accordingly. If they have respect and confidence in their leader, SEABEES will accept a number of tasks without a question. In combat, men expect to be told what to do without delay for explanations. Another reason for keeping your men informed is that people usually fear the unknown. By keeping them informed, you will reduce fear and rumors.

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Some of the following techniques help in applying the principle of keeping your men informed.

- Explain why tasks must be done, and how you propose to do them whenever possible.
- Assure yourself by frequent inspections that immediate subordinates are transmitting necessary information to the men.
- Be alert to detect the spread of rumors. Stop rumors by replacing them with the truth.
- Build morale and esprit de corps by publicizing information about the successes of your unit.
- Keep your unit informed about current legislation and regulations affecting their pay, promotion, privileges, and other benefits.

DEVELOP A SENSE OF RESPONSIBILITY IN YOUR SUBORDINATES

Another way to show your men that you are interested in their welfare is to give them the opportunity for responsible, professional development. Delegation of authority corresponding to responsibility develops mutual confidence and respect between the leader and his subordinates. It also encourages the subordinate to exercise initiative and to give his wholehearted cooperation in accomplishing unit tasks. The leader who properly delegates authority demonstrates faith in his subordinates and increases their desire for greater responsibilities. Failure to delegate authority indicates a lack of leadership.

Some of the following techniques can help you apply this principle of the development of responsible subordinates.

- Operate through the chain of command.
- Tell your subordinates what to do, not how to do it. Hold them responsible for results.
- Give your men frequent opportunities to perform duties of the next higher echelon.

● Be quick to recognize your subordinate's accomplishments when they demonstrate initiative and resourcefulness.

● Correct errors in the use of judgment and initiative in such a way as to encourage the man. Avoid public criticism or condemnation of your men.

● Give advice and assistance freely when your subordinates request it.

● Let your men know that you will accept honest errors without recrimination.

● Assign your men to positions equal to their demonstrated or potential ability.

● Be prompt and fair in backing subordinates. Until convinced otherwise, have faith in each subordinate.

● Accept responsibility willingly, and insist that your subordinates live by the same standard.

ENSURE THAT THE TASK IS UNDERSTOOD, SUPERVISED, AND ACCOMPLISHED

Your men must know what is expected of them and must be informed of specific task requirements through clear, concise orders. Be sure that you are understood when communicating with your subordinates. Men respond quickly to orders that are clear and concise. Do not overstate an order by giving too many details. Subordinates resent oversupervision and harassment. Initiative is developed in men when they can develop their own techniques for performing tasks. However, troops should understand that their leader is available for advice and counsel. The leader must also ensure that the orders are properly executed by either checking personally or through his chain of command.

To apply this principle of communicating clearly, use these techniques.

- Be sure the need for an order exists.
- Use the established chain of command.

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- Through study and practice, develop the ability to think clearly and issue clear, concise, positive orders.

- Encourage subordinates to seek immediate clarification of any point in your orders or directives they do not understand.

- Question your men to determine if there is any doubt or misunderstanding about the task to be accomplished.

- Supervise the execution of your orders.

- Make available those resources your men need to accomplish their mission.

- Vary your supervisory routine and the points that you emphasize during inspections.

- Exercise care and thought in supervision. Oversupervision stifles initiative and creates resentment; undersupervision will not get the job done.

TRAIN YOUR MEN AS A TEAM

Issuing clear, concise orders and checking on their execution is only part of being a successful leader. Your men must be well-trained if they are to accomplish any mission. The leader's duty is to train the members of his unit so that they will be tactically and technically proficient and work as a team. Teamwork is the key to mission accomplishment. It starts in the smallest unit and carries through to the largest organization. Each man must understand that his contribution to the unit's operations is important and recognized.

The basis for accomplishing tasks is teamwork—the better the teamwork, the better the performance. Furthermore, members of a unit will perform better if they have team spirit and a sense of belonging. In football, if the team is “up” for the game, they can often defeat a superior team. So it is with SEABEES. If the unit spirit is “up,” they can often accomplish extremely difficult tasks. It is a two-way street—the unit gives its members a feeling of accomplishment, security, and recognition. In turn, the member gives his best for the unit.

Some of the following methods help in applying the principle of teamwork.

- Provide the best available facilities for team training, and make maximum use of communications exercises and realistic tactical problems.

- Ensure that all training is meaningful, and its purpose is clear to all members of the command.

- Acquaint each element of your unit with the capabilities and limitations of all other elements, thereby developing mutual trust and understanding.

- Ensure that each subordinate leader understands the mechanics of tactical control for his unit.

- Base the team training on current and probable realistic conditions.

- Insist that each leader knows the functions of those with whom he usually operates.

- Ensure that each subordinate leader knows and understands his men.

- Seek opportunities to train with other units, both combat and service.

- Explain responsibilities to each man and the importance of his role in the effectiveness of the unit.

EMPLOY YOUR UNIT WITHIN ITS CAPABILITIES

Good training prepares a unit for its job. The leader must know what his unit is trained to do as well as its capabilities. He must employ the unit within its capabilities. Men get satisfaction from performing tasks that are reasonable and challenging but become dissatisfied if they are given tasks that they consider too easy or too difficult to accomplish. The leader must exercise sound judgment in employing his unit because each time the unit fails his men lose confidence

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in him as a leader. In time, this will lower morale, esprit de corps, discipline, and proficiency.

The following methods help you in applying the principle of employing your unit within its capabilities.

- Keep yourself informed as to the relative operational effectiveness of your command.
- Be sure that you assign reasonable tasks to subordinates. Do not hesitate to demand their utmost in an emergency.
- Analyze all tasks you assign. If the means at your disposal are inadequate, inform your immediate commander and request the necessary support.
- Assign tasks equitably among the elements of your unit.
- Use the full capabilities of your unit before requesting assistance.
- Make decisions by using sound leadership and management principles.

PHYSICAL FITNESS

The NCF has long been aware of the value of, and the need for, maintaining a high level of physical fitness of its personnel. Because of the extreme variation in conditions among various commands, requiring personnel to adhere strictly to only one means of maintaining their physical condition is unrealistic. However, the Navy has developed an excellent program for both deployed and home-ported units. This program can be used to supplement the exercise taken by Naval personnel in performing their daily tasks. The objectives of the Navy fitness program are:

- To promote good health among its personnel in order that each individual has sufficient strength, flexibility, and endurance to carry out their daily tasks with vigor and alertness without sustaining injury and without suffering from undue fatigue.

- To assist personnel in maintaining acceptable body weight and muscle tone in order that they maintain proper military appearance.

- To promote good morale through participation in sports oriented recreational activities.

One of the keys to robust health is to have strong internal organs and cells. If your body is not used to high-level performance, the result is a loss of strength and the ability to function at full capacity. On the other hand, when activity calls for high-level performance regularly, the organs and cells are strengthened. The heart begins to pump more blood with each beat; the lungs deliver more oxygen to the blood with each breath. This makes it possible for the cells to deliver more energy with less strain on the heart and the lungs.

Exercise promotes a state of physical fitness with an accompanying sense of well-being. A great deal of this feeling is brought about by the delivery of an increased amount of oxygen to the cells. When the body is not conditioned, the full potential of the lungs is undeveloped. A program of exercises that challenges the endurance of the body on a daily basis, for at least a brief period, induces nature to develop the lungs fully. Thus, the amount of oxygen the lungs are able to deliver to the blood increases greatly. At the same time, the exercises condition the muscles of the heart so that it pumps the required amount of blood with fewer beats. Additionally, the blood volume increases, the walls of the blood vessels are firmer, and the number and size of the vessels enlarge in some tissue areas. These benefits that can be realized from a program of proper exercises are not a matter of speculation but are established scientific facts.

Total physical fitness is a combination of separate fitnesses, including strength, speed, power, agility, and endurance. Of these, most physicians, physiologists, and physical educators agree that endurance is the one most important fitness factor of them all. While it isn't everything, endurance comes the closest. However, individuals need strength and flexibility apart from functional fitness. Needless to add, overeating, use of tobacco and alcohol, and insufficient rest and relaxation all harm the ability

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of the human machine to use oxygen. Endurance training is simple—except building endurance does not come from just reading about it. You get out of this training exactly what you put into it; and unfortunately, you do not gain much endurance unless it “hurts” a little bit.

HEALTH AND PHYSICAL READINESS PROGRAM, OPNAVINST 6110.1

The purpose of the health and physical readiness program is to ensure Navy personnel are physically healthy, present a good military appearance, and are able to perform duties whenever and wherever required. Guidelines have been established by the program to identify personnel who may be overweight or obese. Personnel, upon checking into a command, are weighed and classified by following the established weight standards. Overweight personnel are assigned to the weight control program.

Appropriate comments are entered in each individual's enlisted performance evaluation report, including a report of the individual's progress in the program. Personnel placed on the weight control program have 6 months to comply with the standards of the weight control program.

If a person is transferred, all weight control records are forwarded to the member's new command. Enlisted personnel who fail to meet weight control standards are subject to either an administrative discharge or disciplinary action. Personnel who are not on the weight control program are weighed once a year. For further information about the program and a list of the weight standards, ask your command weight control officer for a copy of OPNAVINST 6110.1.

MEDICAL GUIDANCE

Annual testing for compliance with minimum physical fitness standards should be preceded by a review of the health status of each individual who may have a medical condition that might interfere with the individual's ability to complete testing requirements. If a medical condition of this kind exists, there is a requirement for a waiver of testing. All levels of command have responsibility to ensure that individuals not physically capable of testing undergo physical review by medical department personnel. A complete physical examination should only be performed when clinically indicated.

CHAPTER 4

SERVICE RIFLE AND PISTOL AND MARKSMANSHIP

As a SEABEE, you make important contributions to Naval Construction Force (NCF) activities. You are important as an individual as well as a SEABEE. The NCF is made up of individuals like you, working together as a team. The ultimate goal of the NCF is success in its construction projects as well as the defense of these projects when needed. Your job is to help achieve that success and to help provide that defense. You may have to fight alone; but most of the time, you will work and help defend a site with other SEABEES under a unit or team leader. You can prepare yourself for defense by acquiring the knowledge and skills needed for using both individual and crew-served weapons. You, as a SEABEE, are likely to be required to use them; therefore, they are discussed in the next two chapters.

Basic and introductory information about SEABEE weapons is given so you can load, fire, field-strip, and clean the service rifle, service pistol, light machine gun, light antitank weapon, grenade launcher, and mortar.

This chapter covers functioning, mechanical training, assembly and disassembly, loading and firing, ammunition, safety precautions, and marksmanship techniques for both the M16A1/M16A2 service rifles and the .45 cal. pistol.

THE M16A1/M16A2 RIFLES

The M16A1 and the M16A2 service rifles (figs. 4-1 and 4-2) are 5.56-mm, magazine-fed, gas-operated, shoulder weapons. Their design provides for either semiautomatic or automatic fire by means of a selector lever.

The M16A1 is equipped with a flash suppressor, but the M16A2 has a flash compensator to hold the muzzle down during rapid and automatic firing.

The barrel of the M16A1 is covered by two aluminum-lined fiberglass handguards (fig. 4-3). These handguards have notches to permit air to circulate around the barrel and to serve further as protection for the gas tube. On the M16A2, the handguards are round and ridged (fig. 4-2), making them stronger and easier to grip. The handguards are interchangeable; the handguard retaining ring is also specially contoured and easier to grip.

A "clothespin" bipod is issued to, and used by, the automatic rifleman. The bipod attaches to the barrel directly beneath the front sling swivel (fig. 4-4).

A forward assist assembly (fig. 4-1), located on the right rear of the upper receiver, permits closing the bolt when the force of the action spring does not.

The trigger guard adapts easily for use in winter operations. A spring-loaded retaining pin is depressed so that the trigger guard swings down along the pistol grip, allowing ready access to the trigger when cold weather mittens are being worn.

An ejection port cover prevents sand and dirt from getting into the ejection port. It should be closed during periods when firing is NOT anticipated and will open by either forward or rearward movement of the bolt carrier.

The M16A2 is an improvement over the M16A1 in the following ways:

- The barrel is 3 to 4 ounces heavier. The new barrel spins the bullet one turn in 7 inches, compared to one turn in 12 inches by the M16A1.

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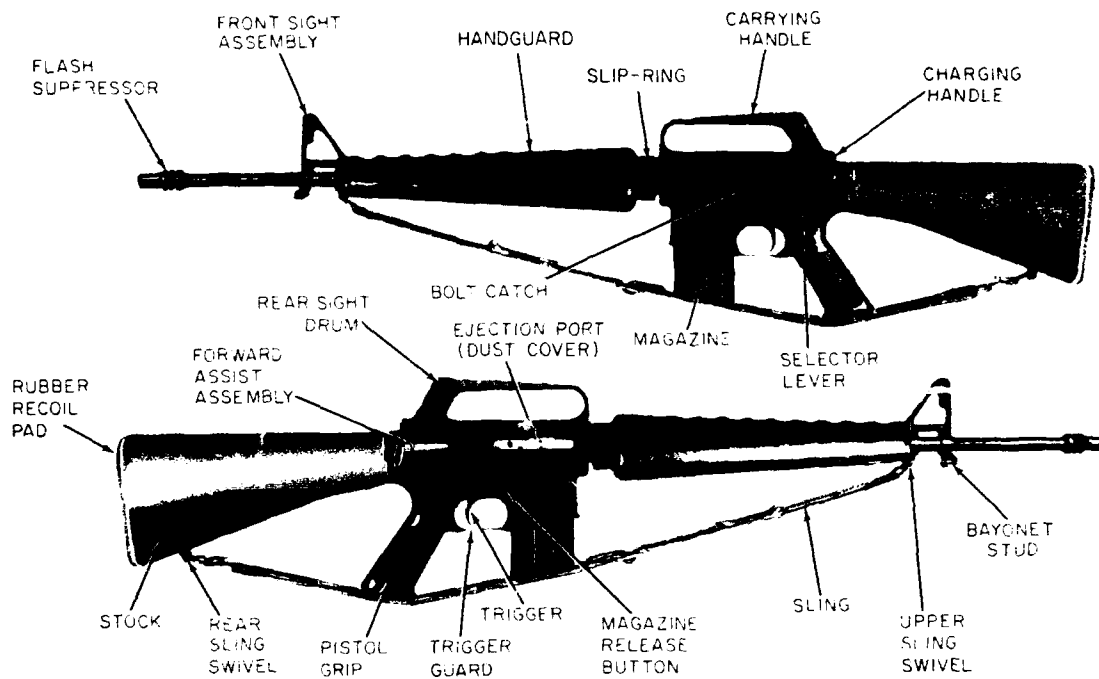


Figure 4-1.—M16A1 service rifle, 5.56 mm, left and right side views.

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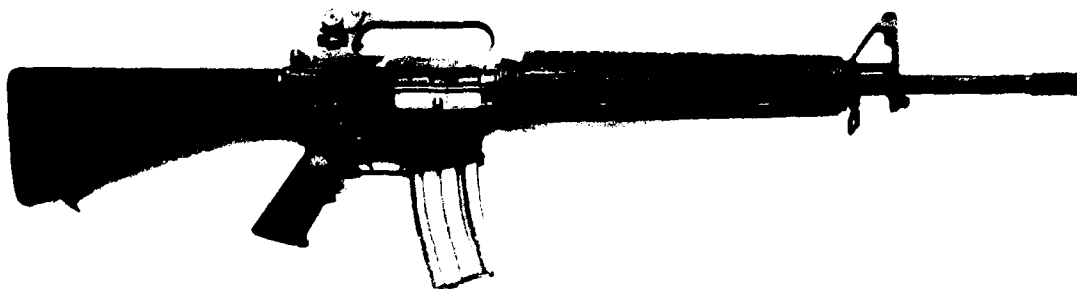
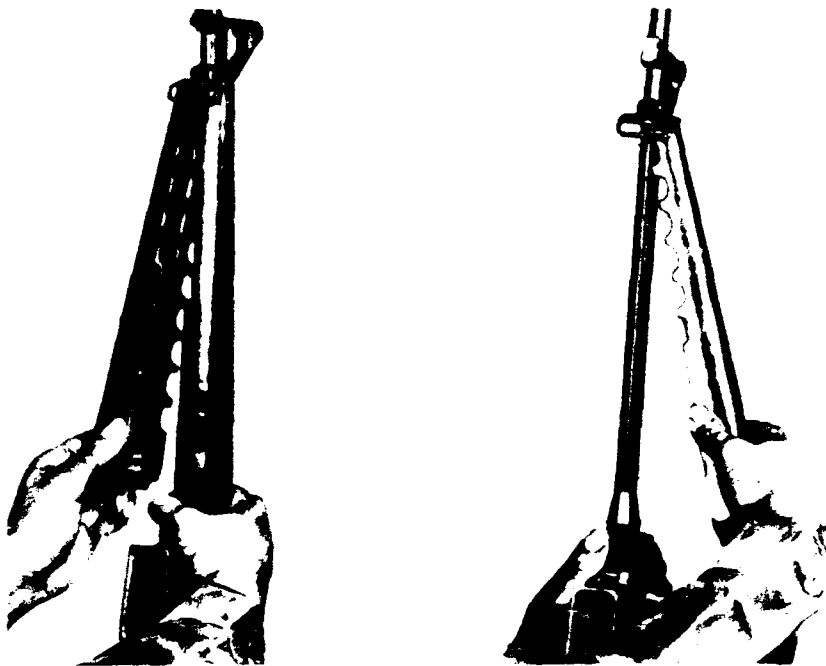


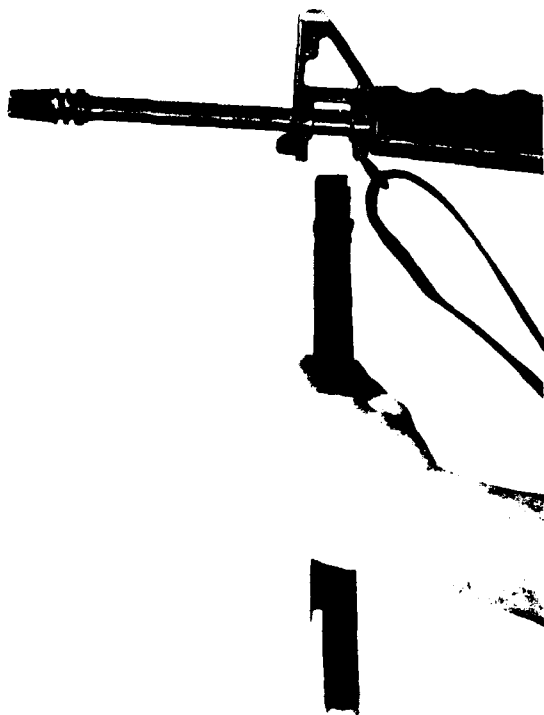
Figure 4-2. M16A2 service rifle, 5.56 mm.

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Figure 4-3.—Fiberglass handguards.



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Figure 4-4.—Attaching "clothespin" bipod to M16 rifle.

- The M16A2 has a maximum effective range of 800 meters compared to 500 meters for the M16A1.

- The front sight post is now square instead of round, making it easier to see.

- The new model will no longer fire fully automatic; it will fire three rounds only per burst in the automatic setting.

- Left-handed shooters have some protection from injury with a built-in brass deflector located at the rear of the ejection port. The stock of the rifle is 5/8 inch longer, making it more comfortable and easier to handle.

Unless specifically stated otherwise, the following discussion of the M16 rifle applies equally to both the M16A1 and M16A2.

For economy in communication, the following maintenance procedures (clearing, field-stripping, assembling, and so forth) for the M16 service rifles are written for the right-handed SEABEE. The left-handed SEABEE can reverse hand directions for these procedures if it improves his efficiency.



Figure 4-5.—Selector lever pointing to SAFE. 29.346

CLEARING THE M16 RIFLE

The first precaution to take in handling any weapon is to make it safe by clearing it. To clear the M16 rifle, place the butt against the right thigh and proceed as follows:

1. Attempt to point the selector lever toward SAFE, the position shown in figure 4-5. If the weapon is not cocked, the selector lever cannot be pointed toward SAFE. If that is the case, do not cock the weapon at this time; instead, go on to the next step in clearing.

2. Remove the magazine, as shown in figure 4-6. Grasp it with the right hand (fingers curled around the front of the magazine, thumb placed on the magazine release button). Apply pressure on the magazine release button with the thumb, and pull the magazine straight out of the weapon.

3. Lock the bolt open, as shown in figures 4-7 and 4-8. Grasp the charging handle with the thumb and forefinger of the right hand, depress the charging handle latch with the right thumb, and pull to the rear (fig. 4-7). When the bolt is fully rearward, press the bottom of the bolt catch with the thumb or forefinger of the left hand (fig. 4-8). Allow the bolt to move slowly forward until it engages the bolt catch, and return the charging handle to its forward position.

4. Inspect the receiver and chamber of the weapon, by looking through the ejection port, to ensure that these spaces contain no ammunition.

5. Check the selector lever to ensure that it points toward SAFE; and then, allow the bolt to go forward by depressing the upper portion of the bolt catch.

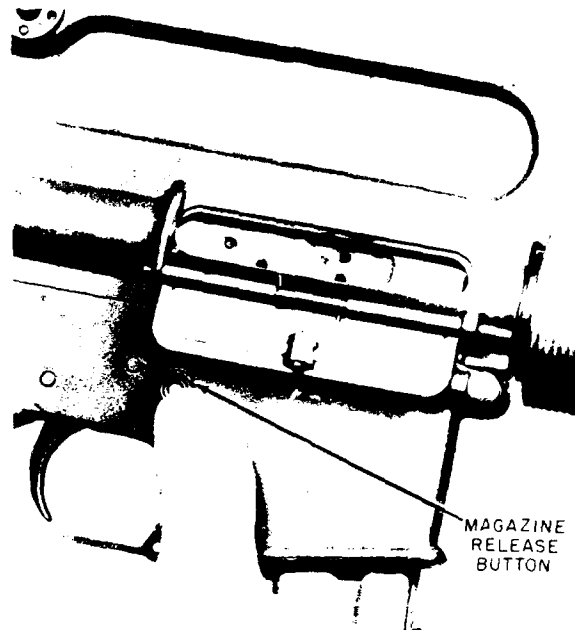


Figure 4-6.—Removing the magazine. 29.347

CAUTION: The selector must be in the SAFE position to prevent damage to the automatic sear during assembly and disassembly.

FIELD-STRIPPING THE M16

The individual SEABEE is authorized to disassemble the M16 to the extent termed "field-stripping." Field-stripping is done without supervision and is adequate for normal

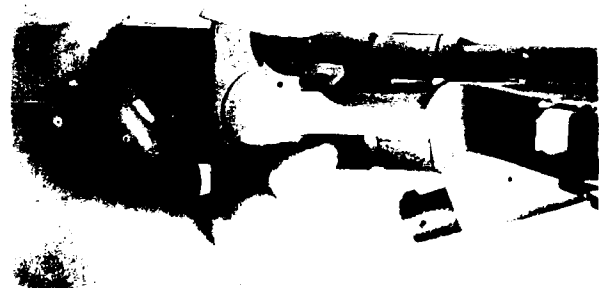
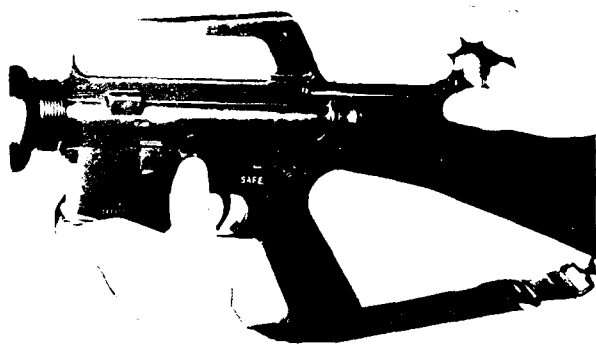


Figure 4-7.—Pulling the charging handle rearward. 29.348



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Figure 4-8.—Locking the bolt open.

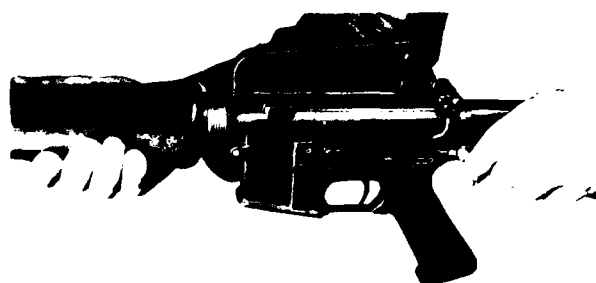
maintenance. As the weapon is disassembled, lay out the parts on a table or other clean surface in the order of removal from left to right. This makes reassembly easier because you can assemble the parts in the reverse order of disassembly.

The steps in field-stripping are as follows:

1. Remove the sling, and place the rifle on a table or flat surface, muzzle to the left.

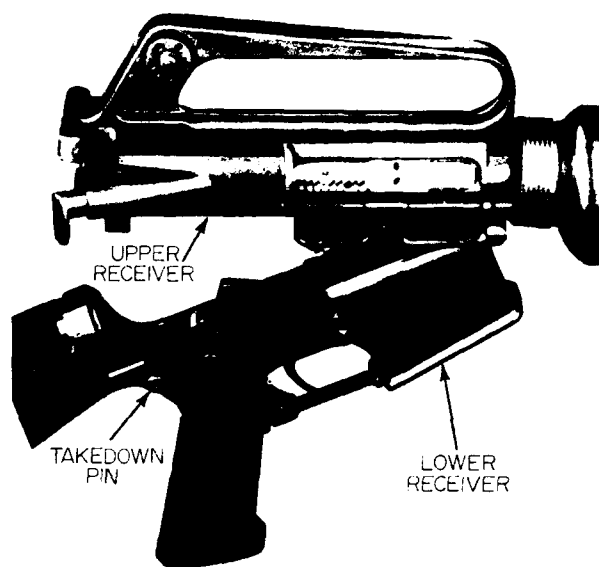
2. Keeping the muzzle to the left, turn the weapon on its right side. Press the takedown pin to the right (fig. 4-9) until the upper receiver swings free of the lower receiver (fig. 4-10). CAUTION: The takedown pin does not come out of the receiver.

3. Press out the receiver pivot pin (fig. 4-11). Separate the upper and lower receiver groups



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Figure 4-9.—Pressing takedown pin to the right.



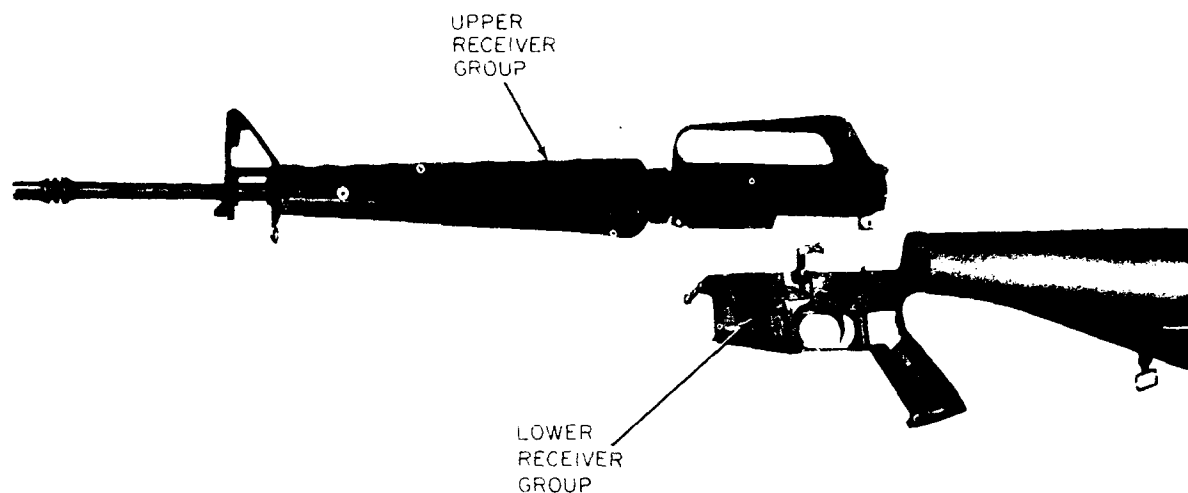
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Figure 4-10.—Breaking upper receiver away from lower receiver.



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Figure 4-11.—Pressing out receiver pivot pin.



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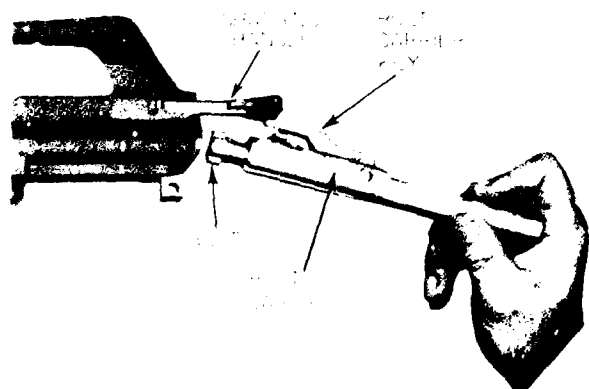
Figure 4-12.—Upper and lower receiver groups.

(fig. 4-12), and place the lower receiver group on the table. CAUTION: The receiver pivot pin does not come out of the receiver.

4. Pick up the upper receiver group, keeping the muzzle to the left. Grasp the charging handle; press in on the latch and pull to the rear (see fig. 4-7) to remove the bolt carrier from the receiver. Grasp the bolt carrier and pull it from the receiver (fig. 4-13). When the bolt carrier is removed, the

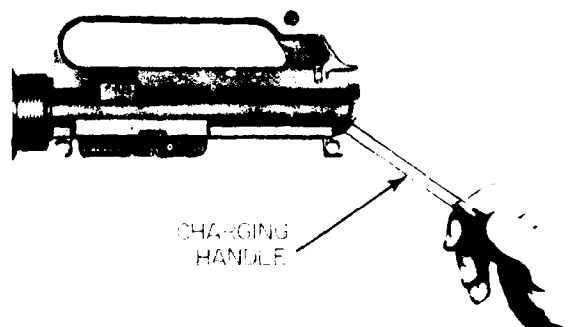
charging handle will fall free of its groove in the receiver (fig. 4-14). Place the receiver on the table.

5. To disassemble the bolt carrier group, press out the firing pin retaining pin (fig. 4-15). Elevate the front of the bolt carrier, and allow the firing pin to drop from its well in the bolt (fig. 4-16). Rotate the bolt until the cam pin is clear of the bolt carrier key. Remove the cam pin by rotating it 90 degrees (1/4 turn) and lifting it out of the well in the bolt and bolt carrier (fig. 4-17). After the cam pin is removed, the bolt can be easily removed from its recess in the bolt carrier (fig. 4-18).



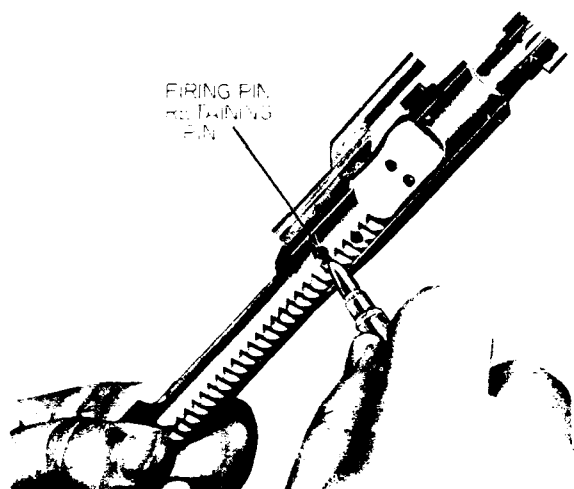
29.354

Figure 4-13. - Removing bolt carrier from receiver.



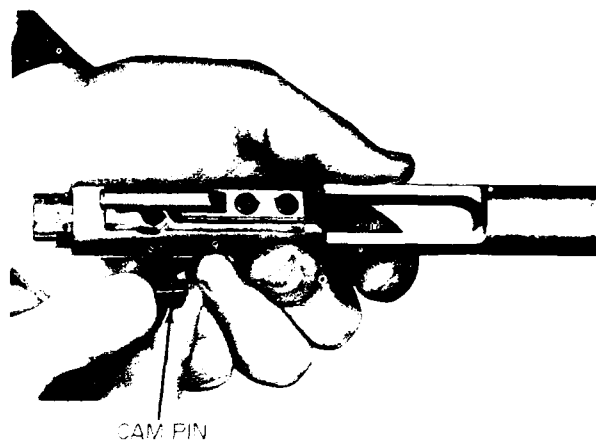
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Figure 4-14. - Removing the charging handle.



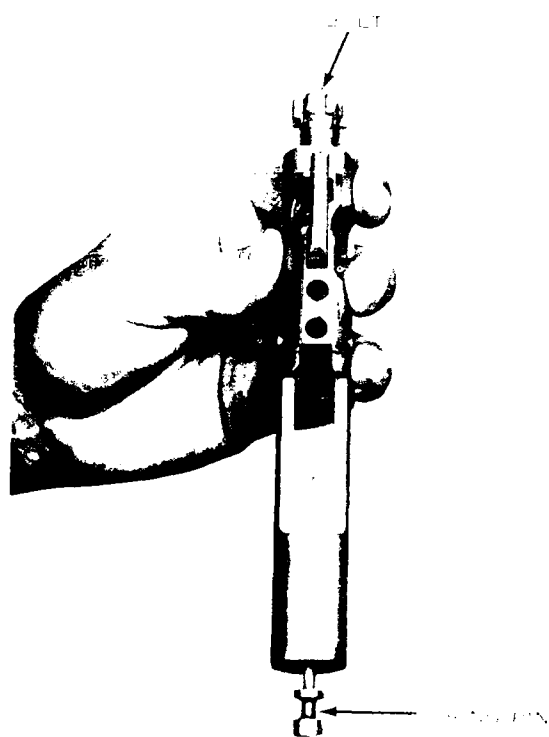
29.356

Figure 4-15.—Pressing out the firing pin retaining pin with the tip of a cartridge.



29.358

Figure 4-17.—Removing the cam pin.



29.357

Figure 4-16. Removing the firing pin.



29.350

Figure 4-18. --Removing the bolt from the bolt carrier.

Remove the extractor by first pushing the extractor pin out with the firing pin. Then, while maintaining pressure on the rear portion of the extractor with your index finger, withdraw the firing pin from the extractor pinhole. Release the pressure from the extractor and remove. The extractor should be disassembled only when necessary for cleaning. Disassembly of the extractor should be supervised. Since the extractor pin is quite small, handle it with care to prevent loss or damage.

NOTE: Do not remove the extractor spring from the extractor. If the spring falls out of its recess, the battalion armorer should replace it.

6. Using the index finger of the left hand, push in on the buffer assembly. With the nose of a cartridge or some similar object, push down on the buffer retainer (view A, fig. 4-19). To remove the buffer assembly, press the hammer downward past the cocked position. After the body of the buffer assembly has cleared the hammer, you can withdraw the action spring from the lower receiver (view B, fig. 4-19).

NOTE: The action spring is under pressure; therefore, take care when you are removing it. Step 6 should be performed only when absolutely necessary for care and cleaning.

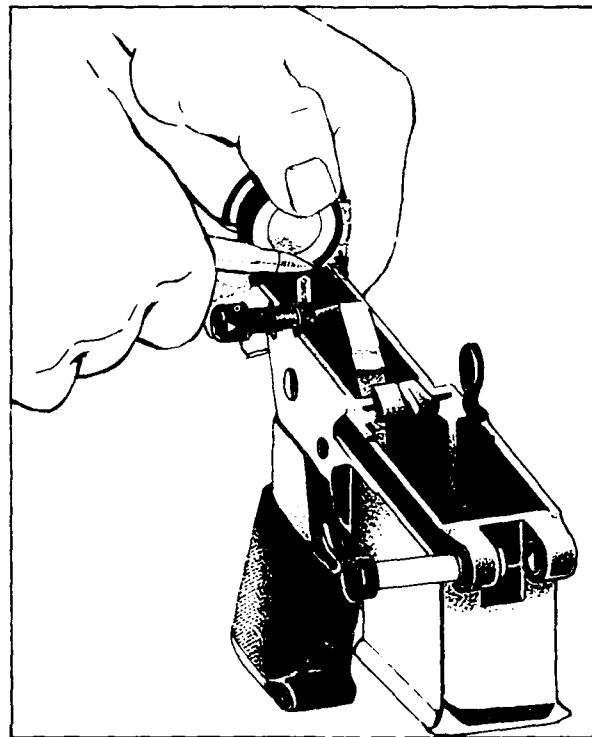
Figure 4-20 shows the M16A1 service rifle field-stripped after you complete the above steps.

ASSEMBLY OF THE M16 RIFLE

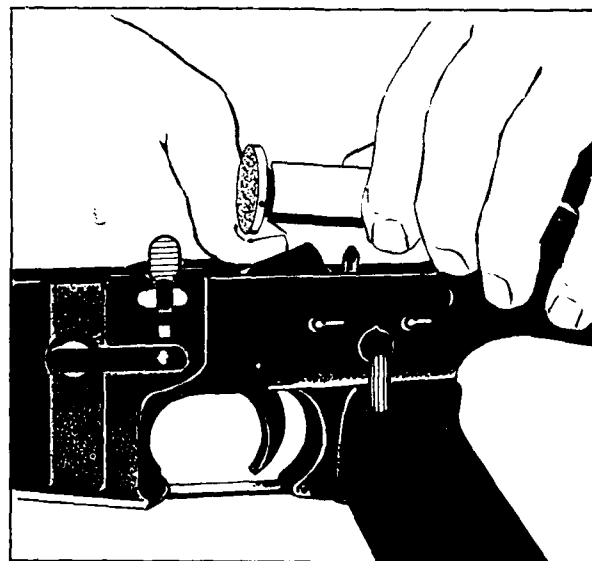
To assemble the rifle, reverse the procedures of disassembly.

1. Insert the end of the assembly spring into the lower receiver extension; depress the cocked hammer to allow passage of the buffer assembly; depress the buffer retainer with the nose of a cartridge or the tip of the firing pin; seat the buffer assembly; and then, release the buffer retainer.

2. Assemble the bolt carrier group by grasping the bolt and the extractor with the action spring. Seat the extractor in the extractor recess; apply pressure on the extractor to align the pinhole; and then, insert the extractor pin. Pick up the bolt carrier with the carrier key up and to the front;



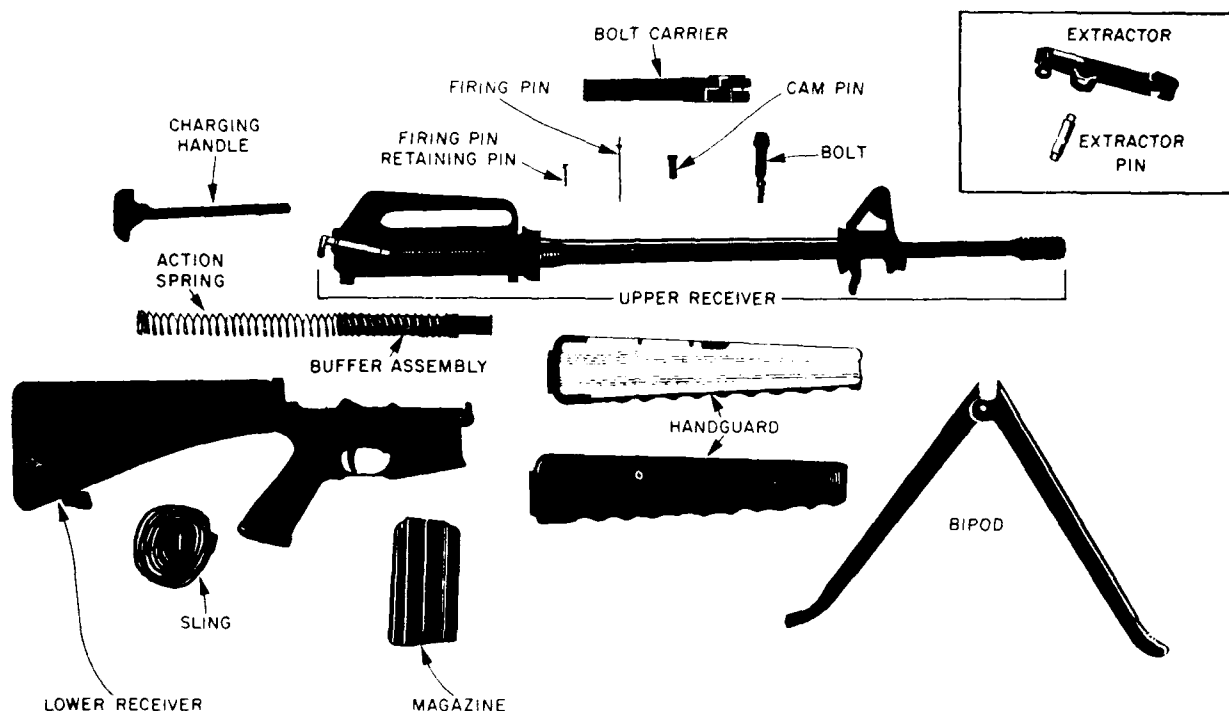
A. DEPRESSING THE BUFFER RETAINER.



B. REMOVING ASSEMBLY AND SPRING.

187.110

Figure 4-19.—Removing the buffer assembly and action spring.



187.111

Figure 4-20.—The M16A1 service rifle field-stripped.

insert the bolt into the front of the bolt carrier, ensuring that the ejector is down and to the left. Replace the cam pin into its well, and rotate the cam pin 90° (1/4 turn) to align the holes for the firing pin in the bolt and the cam pin. Grasp the lugged rim of the bolt, and turn it until the cam pin is directly under the bolt carrier key. Insert the firing pin through the open end of the bolt carrier and seat it fully. Insert the firing pin retaining pin (if you encounter resistance, rotate the pin while inserting it).

CAUTION: Do NOT attempt to spread the slotted end of the firing pin retaining pin. Check for proper assembly by elevating the front of the bolt. If the firing pin drops out, the firing pin retaining pin is not between the front and rear spool. The bolt carrier group is improperly assembled.

3. Grasp the upper receiver with the carrying handle up. Place the charging handle into the groove in the top of the upper receiver. The lugs

on the charging handle must be seated in their grooves in the receiver. Place the bolt carrier group into the open end of the receiver, ensuring that the bolt carrier key is in the slot on the underside of the charging handle and the bolt is forward in the unlock position. Push forward on the bolt carrier group and charging handle until it is fully seated.

4. Place the upper receiver group and lower receiver group together, and reseat the receiver pivot pin.

5. With the hammer cocked and the selector lever in the SAFE position, close the weapon and seat the takedown pin.

6. Replace the handguards, and be sure that the slip-ring is fully seated on the lower lip of both sections of the handguards. Take care to prevent damage to the upper and lower lips and to ensure proper seating.

7. A complete function check of the rifle consists of checking the operation of the weapon while the selector is in the SAFE, SEMI, and AUT positions. Use the following sequence for

a rapid, complete check. You may use any portion of the check alone to determine the operational condition of any specific fire selection.

NOTE: Disengage the takedown pin and open receivers. The hammer must be in the cocked position.

a. **SAFE** position. Pull the trigger; the hammer should NOT fall.

b. **SEMI** position. Pull the trigger; the hammer should fall. Hold the trigger to the rear, recock hammer and release the trigger. The hammer should transfer from hammer hooks and disconnect to the hammer and sear engagement.

c. **AUTO** position. Pull the trigger; the hammer should fall. Hold the trigger to the rear, and recock the hammer. The hammer is now under the automatic sear. Still holding the trigger to the rear, push forward on the automatic sear. The hammer should fall. Still holding the trigger to the rear, recock the hammer, release the trigger, and push forward on the automatic sear. The hammer should transfer to the sear engagement. Move the selector lever to **SAFE** or **SEMI** position. Close the receivers and engage the takedown pin.

CAUTION: If the selector lever is not moved to the **SAFE** or **SEMI** position before you close the receivers, you will damage the automatic sear.

d. **SEMI** position. Pull the charging handle to the rear. Make certain the chamber is clear; then, release the charging handle. Pull the trigger. The hammer should fall.

LOADING THE MAGAZINE

The magazine has a capacity of 20 rounds and may be loaded with any amount up to that capacity. The magazine follower has a raised portion generally resembling the outline of a cartridge. Cartridges are loaded into the magazine so that the tips of the bullets point in the same direction as the raised portion of the follower (fig. 4-21).

CAUTION: Do NOT load or attempt to load more than 20 rounds in the magazine. Overloading will deform the lips of the magazine and cause malfunctions.



29.360

Figure 4-21.—Loading cartridges into the magazine, 20 rounds capacity.

UNLOADING THE MAGAZINE

To prevent damage to the lips of the magazine, remove the ammunition in the following manner:

1. Hold the magazine in the left hand with the open end away from your body and with the nose of the cartridge down (view A, fig. 4-22).

2. Using the nose of the cartridge, depress the center of the second round in the magazine, allowing the first round to drop out of the magazine (view B, fig. 4-22). Repeat this procedure until you remove all the rounds from the magazine except the last one.

3. To remove the last round, use the nose of the cartridge to depress the follower, allowing the last round to drop out of the magazine (view C, fig. 4-22).

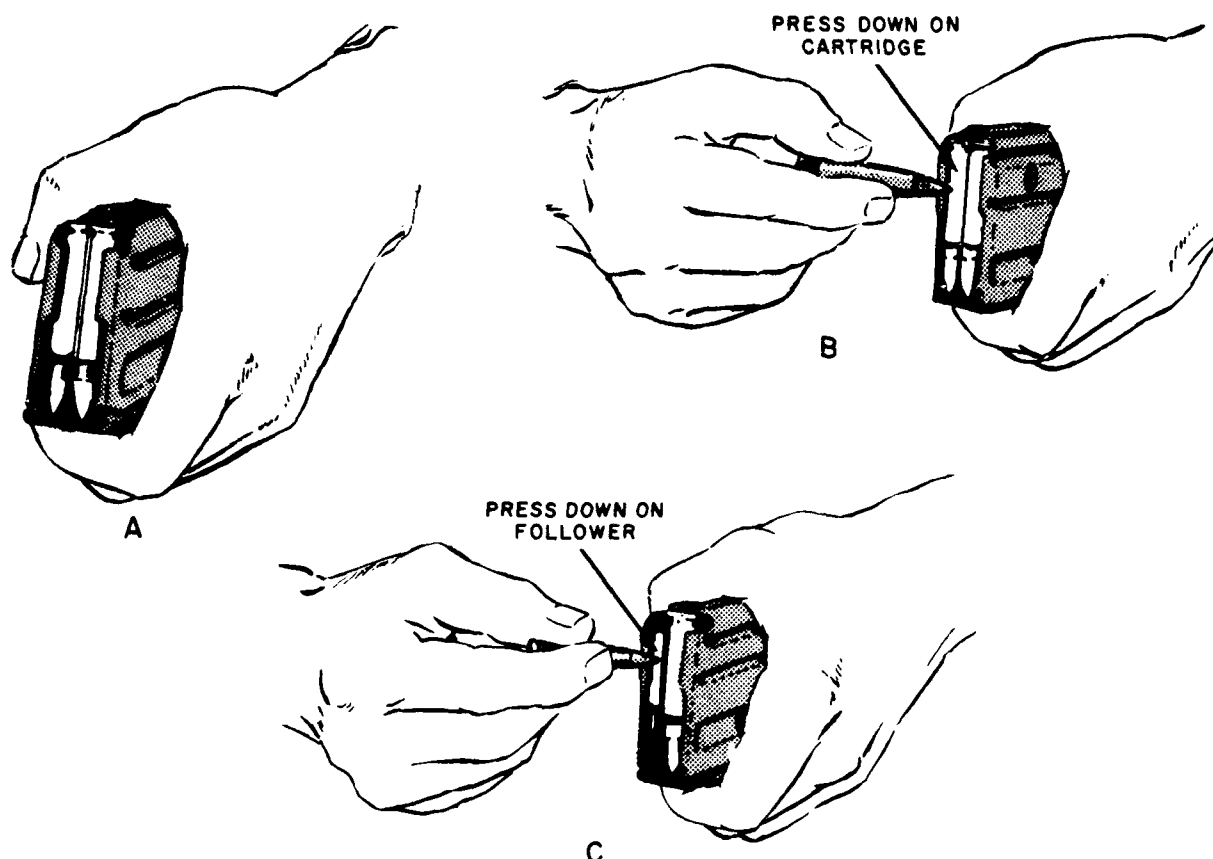


Figure 4-22.—Unloading the magazine with the nose of a cartridge.

187.112

LOADING THE RIFLE

With the hammer cocked, place the selector lever on SAFE. (See fig. 4-6.) Notice that you cannot place the selector lever on SAFE position unless the rifle is cocked. You may insert the magazine with the bolt and bolt carrier open or closed; however, you should learn to load with the bolt open. This reduces the possibility of first-round stoppage and saves the time needed to pull the charging handle to the rear.

Hold the stock of the rifle under the right arm with the right hand. Grasp the pistol grip, then point the muzzle in a safe direction. With the left hand, insert the loaded magazine into the magazine housing. Push upward until the magazine release engages and holds the magazine.

Rap the base of the magazine sharply with the heel of the hand to ensure positive retention. If the action is open, release the bolt by depressing the upper portion of the bolt catch with the thumb of the left hand, allowing the action to close, chambering the round. If the action is closed when the magazine is inserted, pull the charging handle fully to the rear with the right hand and release it. (See fig. 4-7.)

NOTE: Do NOT “ride” the charging handle forward with the right hand. If the charging handle is eased forward from the open position, the bolt may fail to lock. If the bolt fails to go fully forward, use the bolt closure forward assist assembly (fig. 4-1) with the heel of the right hand. The rifle is now loaded and is ready to fire when

you place the selector lever in the automatic or semiautomatic position. If it is not ready to fire, make sure the selector lever is in the SAFE position.

After the last round has been fired, the bolt catch will hold the bolt carrier to the rear. To change the magazine for reloading, press the magazine release button; remove the empty magazine from the weapon.

FIRING THE M16 RIFLE

The rifle will fire semiautomatically or automatically if you move the selector lever to the desired position. (See fig. 4-5.) With the selector lever in the semiautomatic position, the rifle will fire one round each time you pull the trigger. With the selector lever in the automatic position, the M16A1 rifle will continue to fire until the magazine is empty or you release the trigger. The M16A2, mentioned earlier, cannot fire fully automatically, but fires in short bursts of three rounds. When the rifle is fired in either SEMI or AUTO, the bolt will lock in the open position when the last round from the magazine has been fired.

MALFUNCTION, STOPPAGE, AND IMMEDIATE ACTION

A malfunction is a failure of a weapon to function satisfactorily, usually because of excessive friction caused by dirt, improper lubrication, or carbon buildup. To correct this problem you must clean the weapon.

A stoppage is any interruption in the cycle of functioning caused by faulty action of the weapon or faulty ammunition. To correct this problem, you should replace either the worn or broken part or the ammunition.

Immediate action is the action you take to correct the stoppage without analyzing the cause. Immediate action to clear a stoppage in the rifle follows:

1. Strike the forward assist assembly to ensure that the extractor has engaged the round. Tap

upward on the bottom of the magazine to ensure that it is fully seated. Pull the charging handle fully to the rear. Watch for the ejection of a complete cartridge or cartridge case.

2. If a cartridge or case is ejected, release the charging handle to feed a new round (do not ride the charging handle forward). Then strike the forward assist assembly to assure complete bolt closure. Attempt to fire the weapon. If the weapon fails to fire, inspect it to determine the cause of the malfunction and take the correct action.

3. If the cartridge or case is not ejected, check for a round in the chamber. If the chamber is clear, release the charging handle to feed a round, strike the forward assist assembly, and attempt to fire. If the weapon still fails to fire, clear and inspect it to determine the cause of the malfunction and take the correct action.

4. If a cartridge or case is visible in the chamber, you must remove it before attempting to reload or recycle the rifle. Remove the stuck cartridge or case by inserting the cleaning rod into the bore from the muzzle end of the rifle and tapping the cartridge or case.

MISFIRES AND COOK OFFS

These malfunctions rarely happen when you fire only authorized and properly maintained ammunition in properly maintained and operated weapons. However, you must understand the nature of each kind of malfunction as well as the proper preventive and corrective procedures in order to avoid personal injury or damage to your rifle. Procedures for removing chambered cartridges associated with these malfunctions are given below.

1. **MISFIRE.** A misfire is a complete failure to fire; NOT a delay in firing that may be caused by a faulty firing mechanism or a faulty element in the propelling charge explosive train.

2. **COOK OFF.** A cook off is a functioning of any or all of the explosive components of a cartridge chambered in a very hot weapon because of the heat from the continued firing of the weapon. When this happens, attempt to remove the cartridge before 10 seconds elapse. If a cartridge is chambered in a very hot rifle and can neither be fired nor removed, keep your rifle trained in a safe direction. Then, allow for a minimum of 15 minutes to elapse before taking any further corrective action.

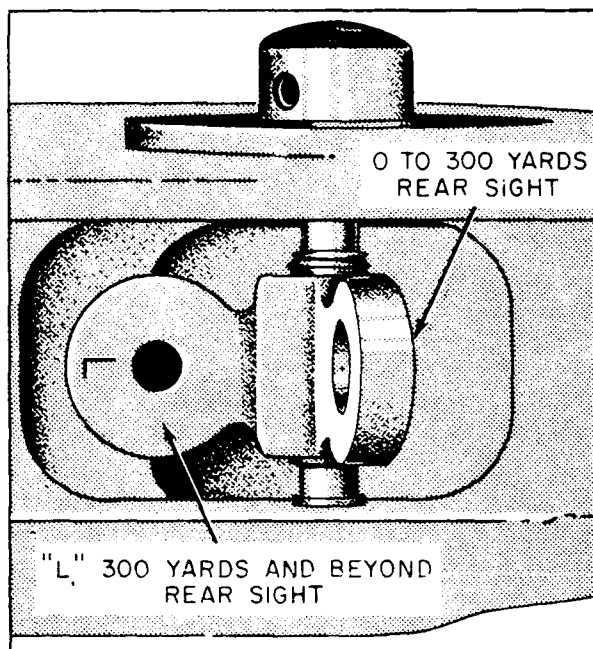
UNLOADING AND CLEARING THE RIFLE

To unload the rifle and make it safe, place the selector lever on the **SAFE** position (fig. 4-5); and remove the magazine by pressing the magazine release button (fig. 4-6). Pull the charging handle to the rear (fig. 4-7), ejecting any round from the chamber. Inspect the chamber and receiver to ensure that it is clear. Releasing the charging handle will allow the bolt to close. To keep the bolt open, depress the lower portion of the bolt catch before returning the charging handle forward (fig. 4-8). The rifle is clear only when no case or round is in the chamber, the magazine is out, the bolt carrier is to the rear, and the selector lever is on the **SAFE** position.

SIGHTS OF THE M16 RIFLE

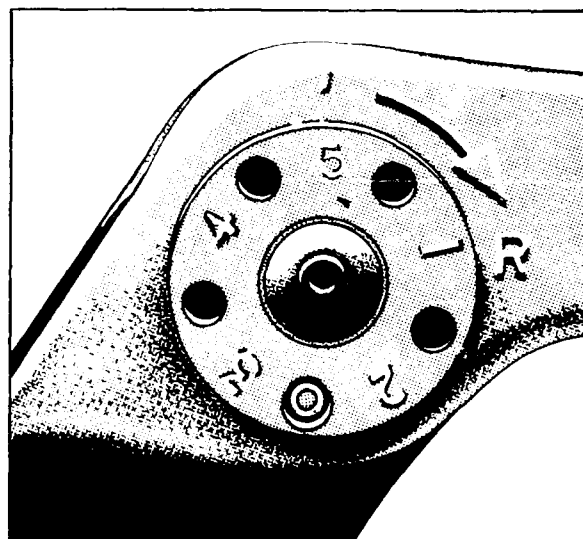
The sights of the rifle are adjustable for both windage and elevation. Windage adjustments are made on the rear sight; elevation adjustments on the front sight.

The rear sight consists of two apertures, as shown in figure 4-23, and a windage drum with a spring-loaded detent, as shown in figure 4-24. The aperture marked "L" is for use for ranges beyond 300 yards; and the unmarked aperture for ranges from 0 to 300 yards. Adjustments for windage are made by pressing in on the spring-loaded stud with either a pointed instrument or the tip of a cartridge and rotating the windage drum in the desired direction.



187.113

Figure 4-23.—Rear sight aperture.



187.114

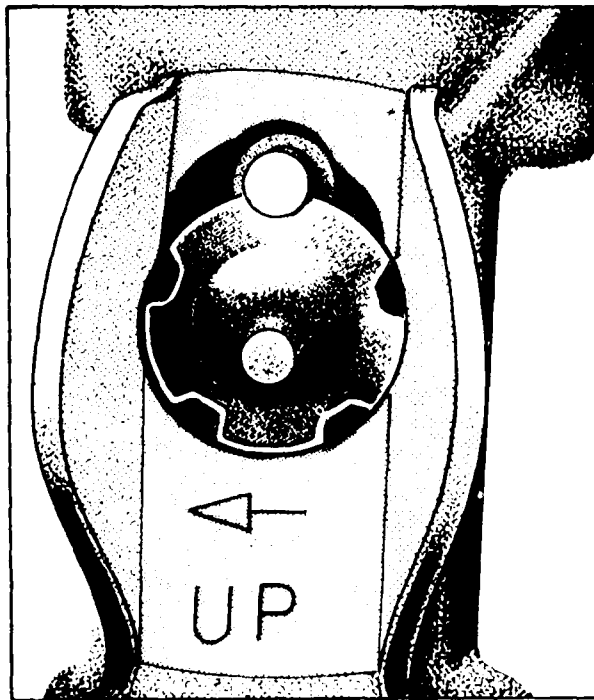
Figure 4-24.—Windage drum.

The front sight of the M16A1 rifle consists of a rotating sight post with a spring-loaded stud (fig. 4-25). Adjustments are made by using a pointed instrument or a tip of a cartridge. To raise or lower the front sight post, depress the spring-loaded stud and rotate the post in the desired direction of change. A spring-loaded detent keeps the post from being moved accidentally. To raise the strike of the bullet, depress the detent and rotate the sight post clockwise.

Each click of elevation or windage adjustment will move the strike of the bullet a specific distance at a specific range. At a range of 100 yards, one click of either elevation or windage on the sights of the rifle will move the strike of the bullet approximately 1 inch, or 2.54 centimeters, up or down.

AMMUNITION FOR THE M16 RIFLE

The 5.56-mm ammunition, as shown in figure 4-26, for the M16 rifle is classified as small arms ammunition and is issued in the form of a



187.115

Figure 4-25.—Front sight, M16A1.

complete round. A complete round (cartridge) consists of all the components necessary to fire the weapon once, that is, projectile (bullet), propellant, and primer. Based upon the type of projectile, the ammunition for use in the rifle is classified as follows:

1. The ball cartridge, M193, is for field use and has no distinguishing marks. When shot from the rifle, its muzzle velocity is approximately 3,250 feet per second. It has a maximum range of 3,000 yards, but the maximum effective range is 500 yards.

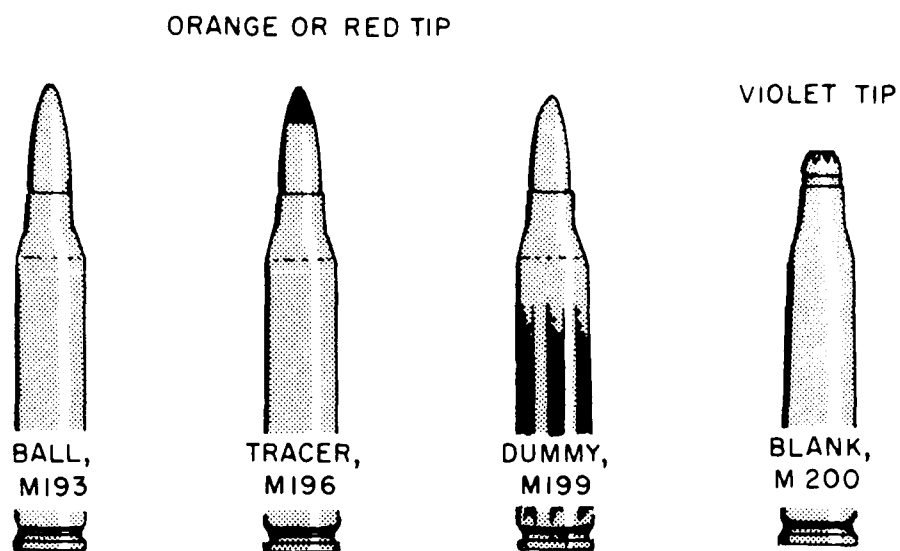
2. The tracer cartridge, M196, is used to observe fire and for incendiary effect. You can identify it by an orange or red painted tip, depending on the ammunition lot number. The use of only tracer cartridges may cause deposits of the bullet-jacket material (metal fouling) to form in the bore and rifling grooves of the barrel. These tracer deposits are extremely difficult to remove and are a potential safety hazard. Therefore, when tracer ammunition is fired in the M16 rifle, you should intermix it with ball ammunition in a ratio of no less than four ball rounds to each tracer round.

3. The blank cartridge, M200, is for use in training and ceremonial salutes. Its case mouth is closed with a rosette crimp that has a violet tip. You can identify it by the knurled band around the lower portion of the case. The grooves help identify the types of cartridges by feel when you cannot see the colored tip in the dark.

4. The dummy cartridge, M199, cannot be fired. You can identify it by six lengthwise ridges in the case. The dummy cartridge is for use in training only.

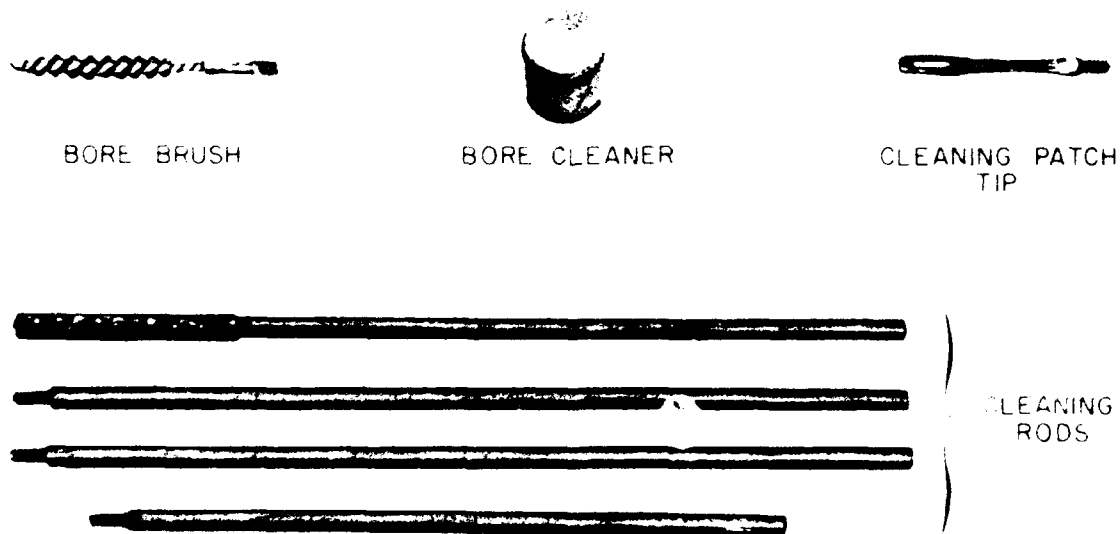
CARE AND CLEANING OF THE M16 RIFLE AND AMMUNITION

A clean, properly lubricated and maintained rifle loaded with clean ammunition will fire when needed. In order to keep the rifle in good condition, it must have care and cleaning. Under bad weather conditions, some key parts may need care and cleaning several times a day. The cleaning material, as shown in figure 4-27, used for the care



187.116

Figure 4-26.—5.56-mm ammunition for the M16A1/M16A2 rifle.



187.117

Figure 4-27.—M16A1/M16A2 rifle cleaning material.

of the rifle is carried in the rifle stock. Special attention must be given to the following areas:

1. **BARREL BORE and CHAMBER.** After dipping a bore brush in the bore cleaner, brush from the chamber to the muzzle using straight through strokes. Do NOT reverse the brush while it is in the bore or it may jam. A jammed brush is hard to remove, and it can possibly damage the bore when you do this. After dipping the brush in bore cleaner, clean the chamber with the chamber brush. Replace the bore brush with a slotted cleaning patch tip, and push the dry patches through the bore and chamber until they come out clean. After cleaning the bore, lightly lubricate the bore and chamber to prevent corrosion and pitting, using the recommended lubricant on a patch. Lightly lubricate the lugs in the barrel extension.

2. **BOLT CARRIER GROUP.** Dip the bore brush in the bore cleaner, and clean the inside of the carrier key. Dry with a pipe cleaner. Clean the locking lugs, bolt, extractor ejector, and bolt rings with the bore brush. Remove any accumulation of dirt, carbon, or oil from the firing pin and the external and internal surfaces of the bolt and bolt carrier. Be sure to wipe all parts dry, then lubricate them with the recommended lubricant.

3. **UPPER RECEIVER GROUP.** With the bore brush or a swab coated with bore cleaner, remove the powder fouling collected on the group. Clean the protruding gas tube inside and outside. After cleaning these components, wipe them dry, and apply a light coat of the recommended lubricant.

4. **LOWER RECEIVER GROUP.** With the bore brush or a swab coated with bore cleaner, remove dirt, carbon, and sand from the lower receiver group. Dry and apply a light coat of the recommended lubricant.

5. **AMMUNITION MAGAZINES.** After removing all cartridges from the magazine, depress the spring steel lock band on the bottom of the magazine, using the nose of a cartridge (view 1, fig. 4-28). Slide the base until it is free of the tabs, and remove it from the magazine body (view 2, fig. 4-28). Remove the magazine spring and follower (view 3, fig. 4-28), but do not remove the follower from the spring (views 4 and 5, fig. 4-28). Clean the exterior and interior of the

magazine with a dry rag or swab. Apply a light coat of the recommended lubricant to the magazine spring only, otherwise keep the magazine dry. You assemble the magazine in reverse order and test it to ensure that the follower is free to move without binding. If the magazine and the ammunition in it gets wet, be sure to wipe them dry as soon as possible. When left wet, both the magazine and the ammunition can become corroded and are very dangerous to use. Remember not to use oil or grease on any cartridge. If you do this, injurious abrasives can collect in the weapon or produce excessive and hazardous chamber pressures when the weapon is fired. Whenever practical, ammunition should be stored under cover. This applies particularly to tracer ammunition.

THE .45-CALIBER SERVICE PISTOL

The .45-cal. service pistol shown in figure 4-29 is an individual weapon intended for use in close combat. The .45-cal. pistol is a semiautomatic, recoil-operated, magazine-fed hand weapon. The pistol fires one round each time the trigger is squeezed. The pistol can be carried in either a hip or shoulder holster.

The magazine holds seven cartridges. The forward movement of the slide strips the upper cartridge from the magazine into the chamber. After the last cartridge from the magazine has been fired, the slide remains in the rear.

Only your ability to rapidly change magazines, aim, and squeeze the trigger limits the rate of fire of the .45-caliber service pistol.

The pistol is 8 5/8 inches in length, weighs 3 pounds fully loaded, with a maximum range of 1,500 yards, and a maximum effective range of 50 yards. It uses different kinds of .45-caliber ammunition. (These will be discussed later under ammunition.)

As a SEABEE, you are expected to keep this weapon in good working condition. To ensure that it will function correctly, you must disassemble it to inspect and clean the parts. Procedures for general disassembly (field-stripping), assembly, functioning, loading, firing, unloading, malfunctions, stoppages, immediate action, and the care and cleaning of the service pistol will be covered in the following sections.

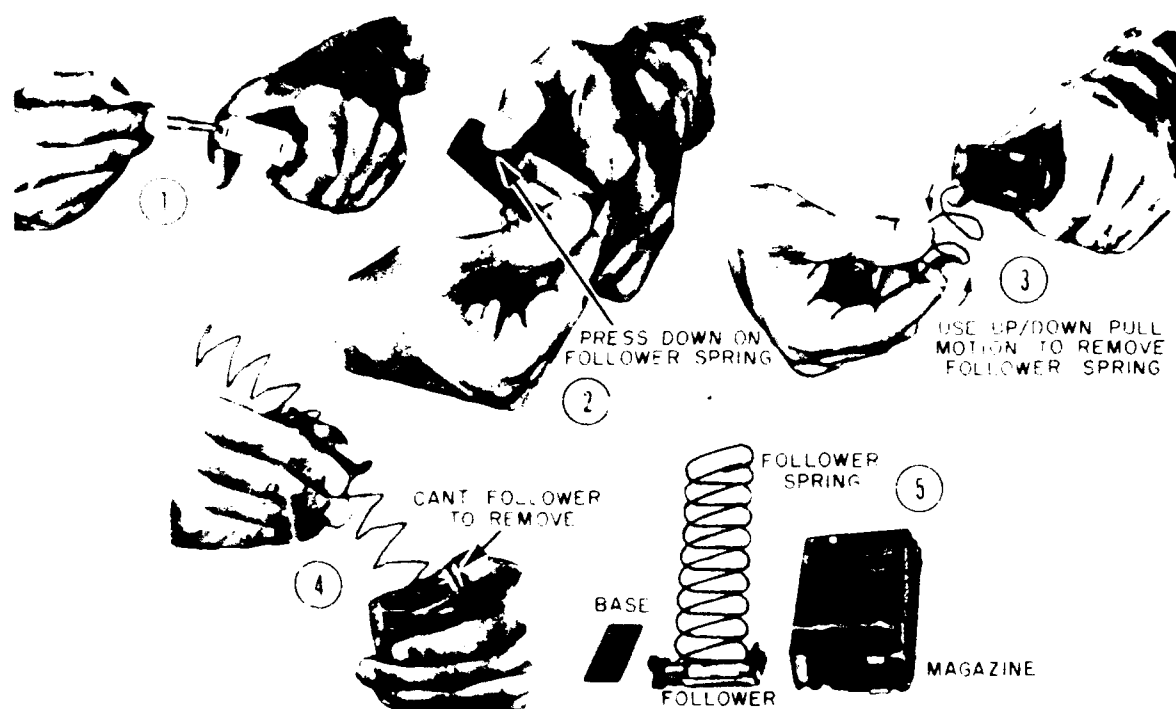


Figure 4-28.—Disassembly of the 20-round magazine.

187.175

GENERAL DISASSEMBLY (FIELD-STRIPPING)

General disassembly is the disassembly necessary for normal care and cleaning. To field-strip the service pistol, perform the following steps in the following order:

1. Hold the pistol in the raised pistol position, press the magazine catch and remove the magazine, as shown in figure 4-30, for a right-handed firer. The left-handed firer should reverse hands for this procedure. Pull the slide to the rear and inspect the chamber to see that the weapon is clear. Press down on the slide stop and allow the slide to move forward. Press the thumb safety lock upward to the SAFE position.

2. Press down on the recoil spring plug and turn the barrel bushing 1/4 turn clockwise, as

shown in figure 4-31. Allow the recoil spring to expand slowly, under control, to prevent injury or loss of the part and remove the plug. Turn the recoil spring plug counter-clockwise and remove it. Leave recoil spring in place.

3. Press the thumb safety lock downward to the FIRE position. Push the slide to the rear until the disassembly notch, as shown in figure 4-32, is aligned with the rear projection on the slide stop. Press the protruding end of the slide stop, and then pull out the slide stop.

4. Pull the receiver rearward to separate it from the slide, as shown in figure 4-33.

5. Remove the recoil spring guide and recoil spring, as shown in figure 4-34. Separate the two parts with a twisting action.

SEABEE COMBAT HANDBOOK

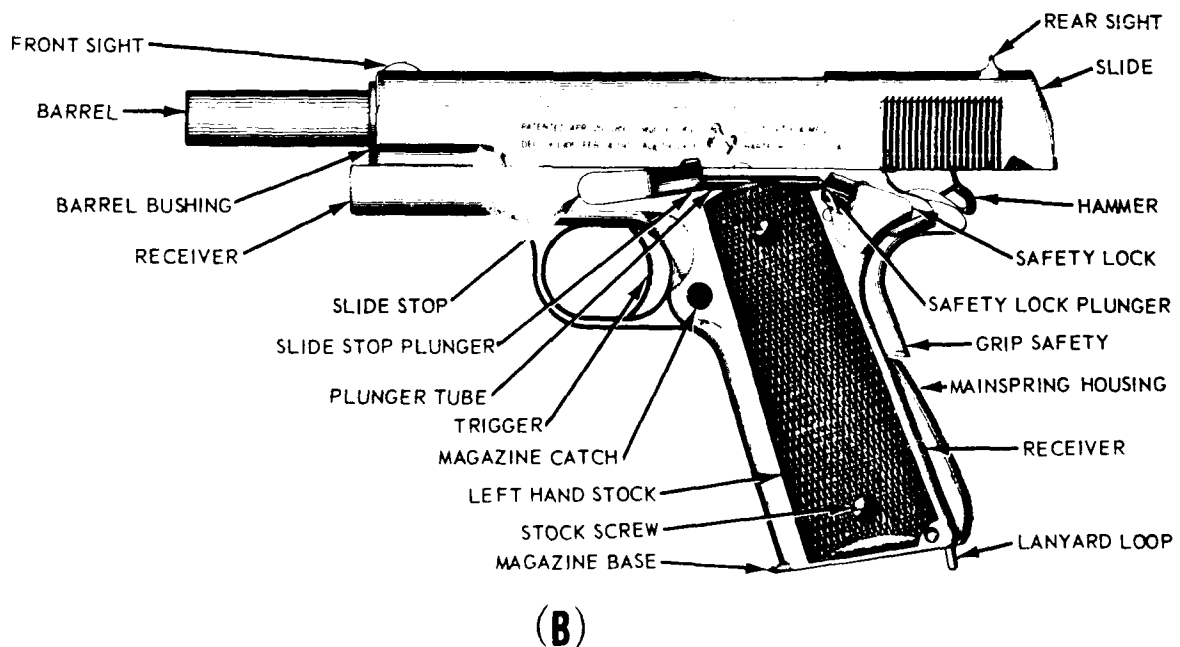
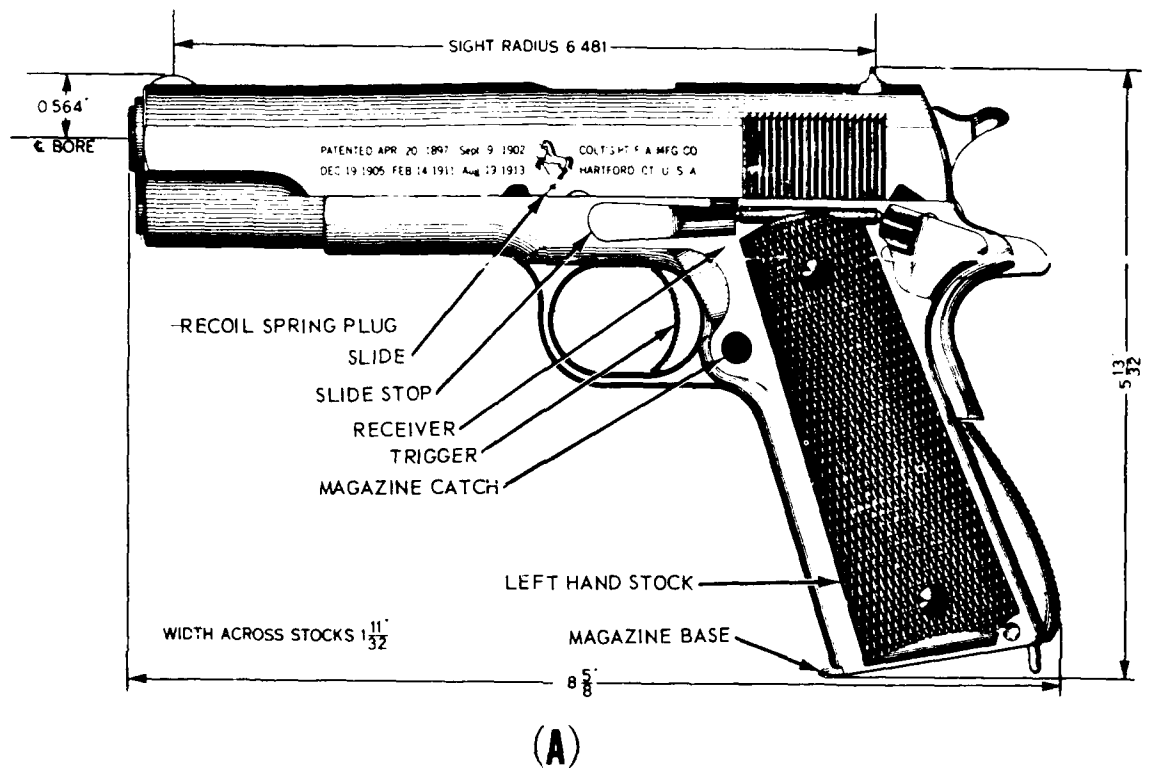
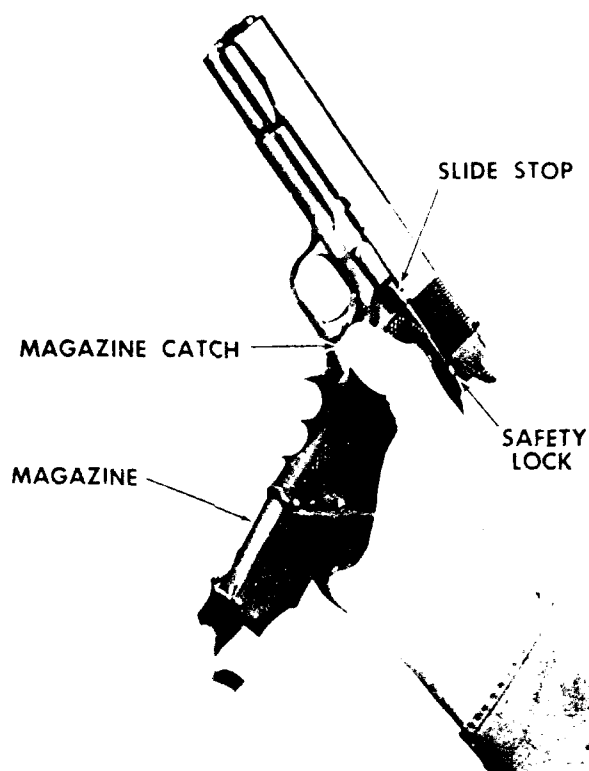


Figure 4-29.—.45-caliber semiautomatic service pistol—(A) assembled and (B) sectional view in recoil position.

17.42



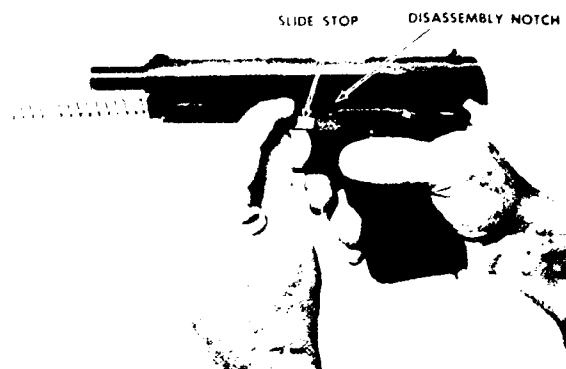
187.120

Figure 4-30.—Magazine removal and chamber inspection for a right-handed firer.



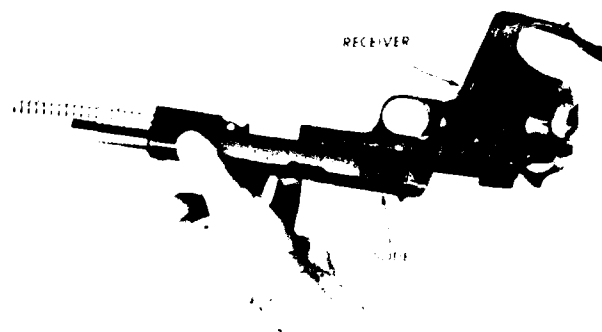
187.121

Figure 4-31.—Recoil spring plug removal from the recoil spring.



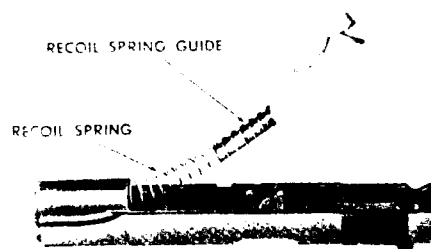
187.122

Figure 4-32.—Slide stop removal.



187.123

Figure 4-33.—Separating the receiver from the slide by pulling the receiver rearward.



187.124

Figure 4-34.—Recoil spring guide and recoil spring removal.

6. Remove the barrel bushing by turning it counterclockwise, as shown in figure 4-35, and pulling it from the slide.

7. Push the barrel link forward and remove the barrel from the front end of the slide, as shown in figure 4-36. This completes the field-stripping. Observe figure 4-37. It illustrates the parts of the pistol in the order of the field-stripping just completed.

PISTOL ASSEMBLY

To assemble the pistol after the field-stripping, replace the parts in the reverse order of the disassembly.

1. **BARREL.** Push the barrel link forward on the barrel and replace the barrel, chamber end first, in the slide. (See fig. 4-36.)

2. **BARREL BUSHING** Place the barrel bushing on the muzzle end of the barrel, push it into the slide, and turn it clockwise. (See fig. 4-35.)

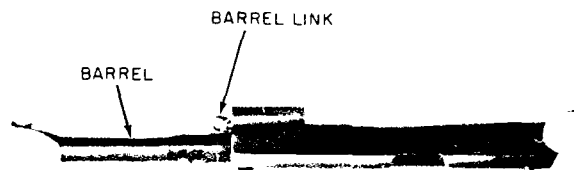
3. **RECOIL SPRING AND RECOIL SPRING GUIDE.** Insert the recoil spring guide into the tightest end of the recoil spring. Replace these parts in the slide. (See fig. 4-34.) Be sure the concave cut on the recoil spring guide collar is properly seated in the barrel. Push the barrel, recoil spring, and recoil spring guide fully forward in the slide, ensuring that the barrel link is positioned forward and rests against the hole in the recoil spring guide. (See fig. 4-33.)

4. **ASSEMBLING THE RECEIVER GROUP TO THE SLIDE GROUP.** Hold the slide with the sights down in the palm of one hand.



187.125

Figure 4-35.—Barrel bushing removal from the slide.



187.126

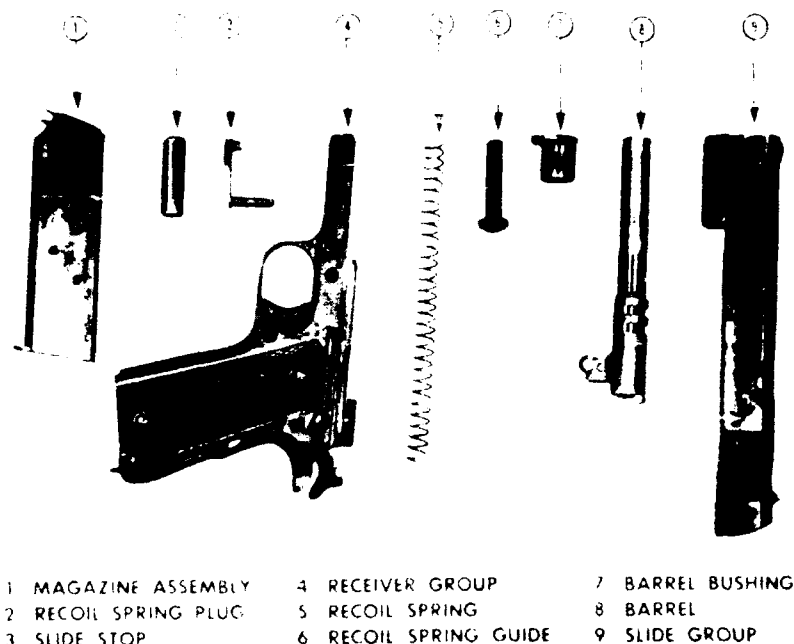
Figure 4-36.—Barrel removal from the slide.

Invert the receiver (the safety lock must be in the FIRE position) and engage the guide rails of the receiver in the grooves of the slide. (See fig. 4-33.) Push the receiver all the way forward on the slide with a quick motion.

5. **SLIDE STOP.** Hold the pistol as shown in figure 4-33. Look through the slide stop pin hole in the receiver for alignment of this hole with the hole in the barrel link. If the holes are not aligned, move the muzzle end of the barrel forward or rearward to align them. Insert the slide stop pin into the holes. Move the slide forward until the disassembly notch is over the square hole in the left side of the receiver. (See fig. 4-32.) Press the slide stop up and in to seat it fully. In some cases, a punch may be required to depress the slide stop plunger in order to seat the slide stop fully.

6. **RECOIL SPRING PLUG.** Push the slide fully forward on the receiver and press the thumb safety lock upward to the SAFE position. Place the recoil spring plug on the recoil spring. Turn the recoil spring plug clockwise to lock the plug to the recoil spring. Holding the pistol as shown in figure 4-31, insert the recoil spring and push downward on the recoil spring plug, compressing the spring until the plug is inside of the slide. Turn the barrel bushing counterclockwise to lock the recoil spring plug in place. Press the safety lock downward to the FIRE position and squeeze the trigger.

7. **MAGAZINE.** Insert the magazine into the magazine recess of the pistol until it is fully seated and held by the magazine catch. (See fig. 4-30.) This completes the pistol assembly.



187.176

Figure 4-37.—Parts of the pistol in order of field-stripping.

FUNCTIONING

By disassembling and assembling the pistol, you become familiar with the parts. Understanding how the pistol functions will help you keep the weapon in operating condition and reduce stoppages that may occur during firing.

Each time a cartridge is fired, the parts inside the pistol (fig. 4-29) function in a given order. This is known as the cycle of operation (functioning).

The cycle of operation of the pistol is divided into eight basic steps; however, more than one step may be occurring at the same time. The steps occur in the order listed below:

1. **FEEDING**—placing a cartridge in the receiver, approximately in back of the barrel ready for chambering
2. **CHAMBERING**—moving the cartridge from the magazine into the chamber
3. **LOCKING**—sealing the cartridge in the chamber and blocking the breech end of the barrel

4. **FIRING**—igniting the primer and firing the cartridge

5. **UNLOCKING**—unsealing the breech end of the barrel

6. **EXTRACTING**—removing the cartridge case from the chamber

7. **EJECTING**—removing the cartridge case from the weapon

8. **COCKING**—returning the firing mechanism to the cocked position ready to fire another cartridge

SAFETY DEVICES

The pistol has three safety devices: the safety lock, the grip safety, and the half-cock notch on the hammer. The safeties must be tested often, and always before the pistol is fired. The disconnecter is not considered a positive safety like the three safeties listed above. The disconnecter is not a positive safety because it is designed for use to fire the pistol on

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semiautomatic fire and cannot be controlled by the firer.

OPERATIONAL SAFETY CHECKS

WARNING: Before making the following test, inspect the pistol to ensure that the magazine is removed and the chamber is empty.

SAFETY LOCK. Cock the hammer and press the safety lock up into the SAFE position. Grasp the stock so that the grip safety is depressed and squeeze the trigger three or four times. If the hammer falls, the safety lock is not safe; and it must be replaced.

GRIP SAFETY. Cock the hammer, being careful not to depress the grip safety, and squeeze the trigger three or four times. If the hammer falls, the grip safety or sear spring must be replaced.

HALF-COCK NOTCH. Pull the hammer rearward until the sear engages the half-cock notch and squeeze the trigger. If the hammer falls, the hammer or sear must be replaced.

LOADING

Draw the pistol from the holster and hold it at the raised pistol position. Insert a magazine loaded with from one to seven rounds of ammunition. Grasp the slide with the left hand, thumb on the right side of the slide. Pull the slide fully to the rear, release, and press the safety lock up to the SAFE position with the left forefinger. Left-handed personnel should reverse the hand positions for this procedure.

FIRING

To fire the pistol right handed, press the safety lock down to the FIRE position with the left thumb to prevent disturbing the firing grip of the right hand. Left-handed SEABEES should reverse the above thumb and hand directions to complete this procedure. Obtain the correct sight alignment and sight picture and squeeze the trigger. To fire successive shots, you must release the trigger and squeeze again. When the last cartridge from the magazine has been fired, the slide returns to the rear.

UNLOADING

To unload the pistol, hold it at the raised pistol position. Press the magazine catch and remove the magazine. If the slide is in the forward position, pull the slide to the rear, and push the slide stop up. Inspect the chamber to ensure that the pistol is clear. Press the slide stop down, allowing the slide to go forward. Keeping the pistol at the raised pistol position, squeeze the trigger, then holster the weapon.

MALFUNCTIONS

A malfunction is a failure of the weapon to function satisfactorily. Malfunctions are classified as defects in the weapon that normally do not cause a break in the cycle of operation. You may discover a malfunction, for example, when the grip safety does not block the trigger or when the slide does not remain to the rear after the last round is fired.

STOPPAGES

A stoppage is any unintentional interruption in the cycle of operation. If the pistol stops firing through no fault of yours or the weapon does not fire when you attempt to fire it, then, a stoppage has occurred.

Stoppages are classified as a malfunction of one of the eight steps in the cycle of operation given in the previous section. Stoppages are usually the result of worn parts or improper care of the weapon.

IMMEDIATE ACTION

Immediate action is the prompt action you take to reduce a stoppage. The procedure for immediate action should be an instinct when you are armed with the pistol. If a stoppage occurs, apply immediate action automatically in an effort to reduce the stoppage without attempting to discover the cause at that time.

If the slide is fully forward, the hammer falls, but the pistol fails to fire, apply the following immediate actions:

1. Manually cock the hammer without opening the chamber and make one additional

attempt to fire. If the pistol still fails to fire, wait 10 seconds; then, come to the raised pistol position. Grasp the slide with the thumb and first finger of the left hand, keeping the thumb on the right side of the slide. Left-handed shooters should reverse hand and thumb directions for this procedure. Rapidly pull the slide rearward to its full extent. Rotate the pistol to the right allowing the unfired round to drop out, release the slide, and allow it to return to the forward position, chambering a new cartridge.

CAUTION: Keep the pistol pointed down-range during this operation.

2. Aim and attempt to fire.

If the slide is not fully forward, apply immediate action as follows: Remove the trigger finger from the trigger guard; and with the nonfiring hand, attempt to push the slide fully forward.

If the slide will not move forward, proceed as follows:

1. Bring the weapon to the raised pistol position.
2. Remove the magazine.
3. Grasp the slide with the nonfiring hand, pull the slide to the rear, and lock it with the slide stop.
4. Inspect the chamber. Remove any obstructions.
5. Insert another loaded magazine into the pistol.
6. Release the slide.
7. Aim and attempt to fire.

CARE AND CLEANING THE PISTOL

Care and cleaning of the pistol includes daily preventive maintenance, which is the ordinary care of the pistol required to preserve its condition and appearance when no firing is done. Cleaning before firing ensures that the pistol is safe to fire and is properly lubricated for efficient operation. Cleaning after firing ensures that all corrosion-inducing agents deposited in the bore and chamber of the pistol are completely removed.

Daily Preventive Maintenance

Damp air and sweaty hands are great promoters of rust. You should clean your pistol and protect it with the recommended oil after every firing or handling. You should inspect the pistol each day and clean it, if necessary.

To clean the pistol, rub it with a rag lightly saturated with oil; then rub it with a dry cloth. Clean the bore with a swab saturated with oil, then, with a dry swab. Dust out all crevices with a small, clean brush.

To protect the pistol after cleaning it, cover all surfaces, including the bore and chamber, with a light coat of lubricating, preservative oil.

After cleaning and oiling the pistol, place it back in your holster or the pistol rack. Do not place a cover, such as canvas, over the pistol because it collects moisture that rusts the metal.

Care and Cleaning Before Firing

Before the pistol is fired, you should clean and dry the bore and chamber and exterior parts of the receiver of the pistol. You should lubricate the guide rails on the receiver and the grooves on the slide with oil. Place a light coat of oil on all other interior metal parts EXCEPT those that come in contact with the ammunition. Excess oil should be removed from the grips and the grip area of the receiver to aid you in gripping the weapon.

Care and Cleaning After Firing

You must clean the pistol as soon as possible on the day of firing and daily for the next 3 days, or longer if necessary. Do this in the following manner:

1. Disassemble the pistol.
2. Clean all parts with a rag lightly saturated with oil. Dry all parts and apply a light coat of oil.
3. Clean the bore and chamber as follows:
 - a. Wet a swab with rifle bore cleaner and run it back and forth through the bore several times.
 - b. Attach the pistol bore brush to the cleaning rod and run it through the bore and chamber several times.

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c. Run dry swabs through the bore and chamber until they are clean.

d. Inspect the bore for cleanliness. If it is not free of all residue, repeat the cleaning process.

e. When the bore and chamber are clean, coat them with rifle bore cleaner and leave it on overnight.

f. Assemble the pistol.

g. Apply a light coat of oil to the exterior surfaces of the pistol.

h. After the third daily cleaning, if the bore and chamber are clean, remove the rifle bore cleaner. Replace the bore cleaner with a light coat of lubricating, preservative oil.

AMMUNITION

As a SEABEE armed with the .45-caliber pistol, you must be familiar with the types of ammunition for your pistol and be able to identify each type of ammunition.

A pistol cartridge is a complete assembly consisting of all the components necessary to fire the weapon once; that is, the cartridge case, bullet, propellant powder, and primer.

The types, use, and means of identification of the ammunition used in the .45-cal. pistol are the following:

1. Ball cartridge, M1911, is for use against personnel and light material targets. The ball round consists of a metal jacket surrounding a lead alloy core. The bullet tip is unpainted.

2. Blank cartridge, M9, is used to simulate fire and for salutes. This cartridge can be fired single shot only in the pistol. You can identify it by the absence of a bullet and by its tapered mouth.

3. Dummy cartridge, M1921, is used for training personnel in the operation of loading and unloading the pistol and for testing weapons. It is used also in marksmanship training by mixing it with live ammunition during instruction practice firing. You can identify this cartridge by the empty primer pocket and the two holes in the cartridge case.

4. Tracer cartridge, M26, is used for observation of fire. Secondary uses are for incendiary effect and for signaling. The cartridge consists of three parts: (1) a copper-plated steel, or guiding metal-clad, steel jacket; (2) a slug of lead, hardened with antimony (a chemical hardening

element); and (3) a tracer mixture in the rear portion of the jacket. For identification, the bullet is painted red for a distance of approximately 3/16 inch from the tip.

Small arms ammunition is generally safe to handle. However, you must protect the ammunition you are using from mud, sand, dirt, and water. Keep it clean and dry, ready for use.

Do NOT oil or polish pistol cartridges.

Do NOT expose the ammunition to the direct rays of the sun for any length of time. If the powder is heated, excessive pressure will develop when the weapon is fired. This condition will affect the accuracy and the operation of the weapon.

Do NOT attempt to fire cartridges that have dents, scratches, loose bullets, or corroded cases. If any cartridges are defective, turn them in to your supply point. Do not throw away or attempt to destroy defective ammunition.

Do NOT strike the primer of a cartridge; it may ignite and cause injury.

MARKSMANSHIP

The purpose of marksmanship training is to provide you with the proper information and instruction to help make you a safe and effective shooter.

Good shooting, whether on the firing range or in combat, depends upon the application of basic marksmanship principles. These principles are interrelated and must be properly practiced each time you fire a shot if you wish to achieve effective results.

There are two parts to this section. The first part describes the techniques of firing a rifle and a pistol. The second part deals with the principles and practices of directing and controlling the combined fire power of rifles and machine guns.

FIRING TECHNIQUES—RIFLE

The most important factors involved in correct sighting and aiming are proper sight alignment

and a correct aiming point. Together they make up the sight picture.

Sight Alignment

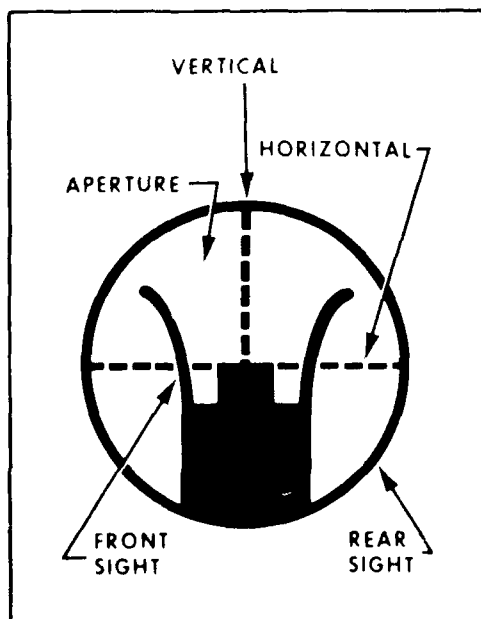
Sight alignment is the art of looking through the rear sight aperture, focusing the eye on the front sight post (or blade), and centering the front sight post exactly in the rear sight aperture both vertically and horizontally. The body of the front sight post, or blade, is centered vertically. The tip of the front sight post, or blade, is centered horizontally within the rear sight aperture (fig. 4-38).

REAR SIGHT.—In each firing position (standing, sitting, kneeling, and prone), the aiming eye will be at a slightly different distance from the rear sight. This distance, referred to as eye relief, will cause the opening (peep) of the rear sight to appear larger or smaller, depending on the firing position. Regardless of the apparent size of the rear sight opening, the front sight must be aligned in the center of the opening. It is important that your

eye always be the same distance from the peep sight in any particular firing position. To ensure this distance is always the same, you must hold the rifle in the exact location for each shot. This location is commonly called the SPOT WELD, or anchor. There are several tricks shooters use to help them maintain this distance. One is to place a small piece of tape on the stock of the rifle where it touches the cheek. In this manner, the shooter can feel with his cheek if he has the proper eye relief.

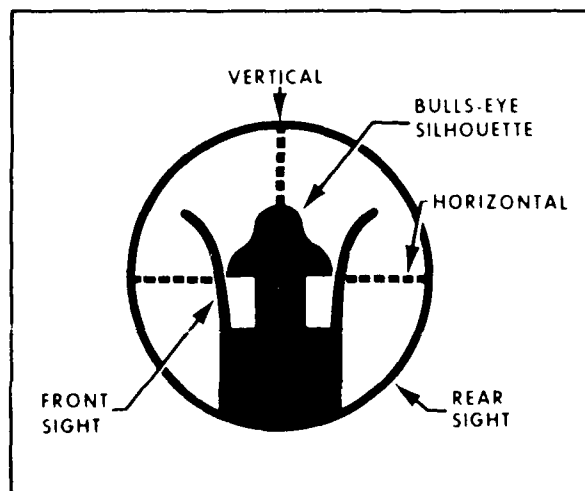
FRONT SIGHT.—The front sight will always appear to be the same size. However, depending on the distance the eye is from the rear sight, more or less of the front sight may be visible in the sight picture. The front sight, not the target, is the point of focus for the eye; and as such, it will be sharp and distinct in outline. For this reason, keep the front sight square, leveled, and blackened.

AIMING POINT.—The aiming point is that point on the target upon which the weapon's sights are brought to bear. The correct aiming point is at "6 o'clock," that is, the bottom of the bull's-eye of a type "A" target (fig. 4-39) or



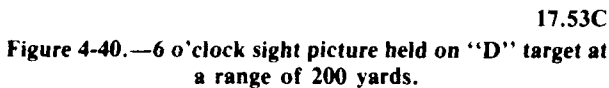
17.53A

Figure 4-38.—Proper sight alignment.



17.53B

Figure 4-39.—6 o'clock sight picture held on "A" target at a range of 200 yards.

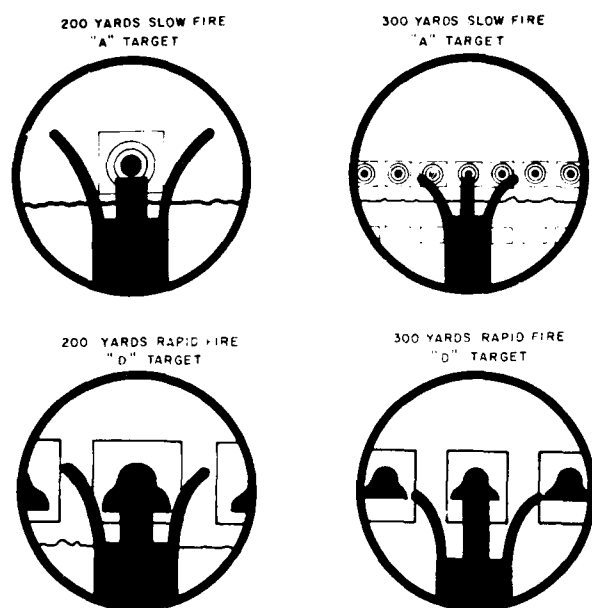


SIGHT PICTURE.—You obtain the correct sight picture by aligning the rear sight, the front sight, and the bulls's-eye (figs. 4-39 and 4-40). Each of these three elements affects the sight picture. As you can see from figure 4-41, any error in sight alignment will increase as the range increases. An error in the aiming point remains constant as the range increases. Therefore, of the two, sight alignment is the most important.

At close ranges, the bull's-eye or silhouette will appear larger, in relation to the front sight, than



Figure 4-41.—Error in sight alignment increases as range increases.



17.53E

Figure 4-42.—Variation in sight picture for each range fire.

it will at longer ranges. This means that the sight picture will vary not only from one firing position to another but also from one firing line to another (fig. 4-42).

TRAINING.—You will receive training in aiming along with the position and trigger squeeze prior to actually firing on the rifle range. You do this by aiming at a series of small bull's-eyes at least 20 feet away on a "dry-firing" range; this training is known as "snapping in."

BLACKENING SIGHTS.—You should blacken the sights during sighting and aiming exercises to help eliminate light reflection or glare. Blacken all sights, both front and rear, the base of the receiver, and the top of the barrel. The usual way of blackening a sight is by means of a smudge pot, carbide lamp, oily patch, candle, cigarette lighter, or ordinary match. Be sure to remove all oil from the sight before blackening it.

Shooting Positions

A correct shooting position is essential to obtain the best results in rifle shooting. The better the position, the easier it is to hold the rifle and squeeze the trigger while the sights are properly aligned on the target. However, no degree of excellence in the position will compensate for lack of practice. You may have difficulty in assuming a correct position until sufficient practice has limbered up your muscles. Once your muscles are limber, you will find the positions both comfortable and steady.

The SEABEE qualification course requires you to learn and use four standard positions: standing, kneeling, sitting, and prone. These positions have been selected as a result of experience and have been found to produce excellent results with men of all physical types.

Once you master the correct positions, you must combine sighting and aiming with your practice. Learn to get into the correct position and align the sights without moving the rifle. If the target is not properly aligned with the sights, you must move your body instead of the rifle until you obtain the proper sight picture.

PRONE POSITION.—The prone position (fig. 4-43) is a steady position that is easy to assume and excellent for initial training. In the field, the position presents a low silhouette and is readily adaptable to the use of cover and support. However, observation from this position is difficult.



17.56

Figure 4-43.—Prone position.



Figure 4-44.—Stand position.

STANDING (OFF-HAND) POSITION.—The standing position (fig. 4-44) is used to engage surprise targets that appear at close ranges. Normally, you use this position when engaging targets less than 100 yards in range and when you are constantly firing and moving.



Figure 4-45.—Kneeling position.

KNEELING POSITION.—The kneeling position (fig. 4-45) is a natural position that can be assumed quickly. It is suitable for use on level ground or on ground that slopes upward.

SITTING POSITION.—There are three variations of the sitting position: open leg, cross leg, and cross ankle. The position used depends entirely on the shooter. For steadiness, the open-leg position (fig. 4-46) is second only to the prone position. This position is especially suited for use on ground that slopes downward. The other two alternate sitting positions are the cross-legged position (fig. 4-47) and the cross-ankled position (fig. 4-48).

Trigger Control

The most important single factor in marksmanship is trigger control. Everything about your position and aim may be perfect; but if you don't squeeze the trigger properly, your shot will not go where you aimed it.

The prime consideration in trigger control is that the trigger must be squeezed smoothly, gradually, and evenly straight to the rear. Any sideward pressure, however slight, applied to the trigger during its rearward movement will likely result in a wide shot. Similarly, upward or downward pressure on the trigger will result in high or low shots.



Figure 4-46.—Sitting position.



187.57

Figure 4-47.—Cross-legged position.

The trigger hand must grasp the stock or pistol grip firmly, but without strain, so that the trigger finger will have proper support in overcoming the trigger weight. An unnatural, straining grasp will cause excessive muscular tension in the hand, resulting in a tremor, that will also be transmitted to the weapon.

The index finger should make contact with the trigger at the place that will best produce a movement straight to the rear. This is usually



187.58

Figure 4-48.—Cross-ankled position.

between the first joint and the tip. The trigger (index) finger must not touch the receiver or rifle.

Once the sights are lined up, apply pressure on the trigger and gradually increase it until the hammer releases and the shot fires. If at any time during this process the sights drift off the target, interrupt the trigger squeeze, but maintain the pressure. When the sight picture is again correct, continue the squeeze until you fire the shot.

When you fire from the standing position, coordination of trigger squeeze and proper aim is very critical. The shooter must start and continue his squeeze only when the front sight is momentarily at rest or is slowly moving in the smallest area of the bull's-eye. An inexperienced shooter usually tends to "snap shoot" in this position. That is, he attempts to complete the trigger action instantly as the front sight moves across the aiming point. This invariably results in jerking the rifle and producing a wild shot.

Squeezing the trigger correctly is not as easy as it may appear; the technique must be fully mastered. To assist you in remembering the correct technique, the acronym, BRASS, was developed.

B—BREATH. Proper breathing is essential. It will help you relax, steady your aim, and clear your vision. First, take a normal breath; then, release part of it (enough to be comfortable); and hold the remainder. Do not hold your breath for more than 10 seconds before shooting. This may tense your muscles and blur your vision. If you do not shoot during this breathing period, take another normal breath and repeat the procedure.

R—RELAX. You must relax. The more relaxed you are the better your shot will be.

A—AIM. Concentrate on the proper sight alignment of correct sight picture. Focus your eye on the front sight post (blade).

S—SLACK. Some rifles have a certain amount of slack in the trigger. Take up this slack before starting your squeeze to the rear to fire. The M16 trigger slack is insignificant, and this step is generally omitted when firing that weapon. Knowing your weapon is important here.

S—SQUEEZE. Squeeze the trigger as previously described. If you squeeze it properly, you will not know when the round will fire. This will prevent flinching caused by anticipation of the shock, or recoil, from the exploding cartridge.

Calling Your Shot

One of the best ways of developing good shooting habits is to learn to call your shot. To do this, you must notice exactly where you aim the sights at the instant you fire the shot and call out immediately where you think the bullet will hit. This takes a lot of concentration. Any shooter who cannot call his shot correctly is either blinking or flinching. Shots are called by the "clock method." An example would be "bull's-eye at 4 o'clock." That is, the shot hit the lower right portion of the bull's-eye.

Wind and Wind Effect

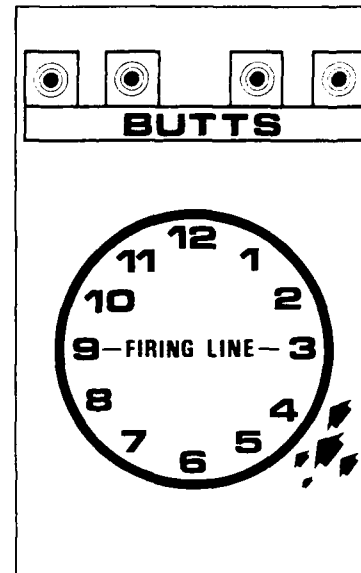
One of the most important influences on rifle shooting is wind. Wind affects shooting in two principal ways: It literally blows the bullet off course; and it buffets the shooter, making proper aiming difficult.

The effect on the bullet in flight progressively increases as range increases. A wind that will have little or no effect on a bullet at 200 yards will have some effect on one at 300 yards. The wind's effect on the bullet in flight is compensated for by applying proper windage to the sights.

The effect of wind on the shooter's body depends on the relative stability of the various shooting positions. Wind that has no effect on the prone shooter might have some effect on the sitting shooter, a greater effect on the kneeling shooter, and a definite adverse effect on the standing shooter. The effect of the wind on your body can be decreased through the development of the best possible shooting positions.

Wind Direction and Force

The direction of wind is explained by reference to the face of a clock. The firing line is thought



187.59

Figure 4-49.—4 o'clock wind.




of as the center of a big clock face with 12 o'clock toward the target butts and 6 o'clock to the rear. Wind blowing from the right rear is a 4 o'clock wind (fig. 4-49).

Wind Reading Aids

Wind direction and force can be quickly determined by observing the range flags. Figures 4-50 and 4-51 give examples using the range flag. If no flag is visible, use the following observations as a guide in determining wind velocities:

1. Smoke drifts slightly—less than 2 mph wind
2. Wind can be felt lightly—3 to 5 mph wind
3. Tree leaves move constantly—5 to 8 mph wind
4. Wind raises dust and loose paper—8 to 12 mph wind
5. Small trees sway—12 to 15 mph wind

Chapter 4—SERVICE RIFLE AND PISTOL AND MARKSMANSHIP

<p>FLAG STRAIGHT OUT WIND FORCE MEDIUM TO HEAVY 15 TO 25 MPH</p>		<p>WINDAGE EFFECT 200 YARDS 2 TO 3 CLICKS 300 YARDS 3 TO 5 CLICKS</p>
<p>FLAG 30° TO 45° OUT WIND FORCE LIGHT TO MEDIUM 7 TO 11 MPH</p>		<p>WINDAGE EFFECT 200 YARDS 0 TO 2 CLICKS 300 YARDS 2 TO 3 CLICKS</p>
<p>FLAG 8° TO 10° OUT WIND FORCE NONE TO LIGHT 2 TO 5 MPH</p>		<p>WINDAGE EFFECT 200 YARDS 0 CLICKS 300 YARDS 0 TO 1 CLICK</p>

187.60

Figure 4-50.—Range flag wind reading.

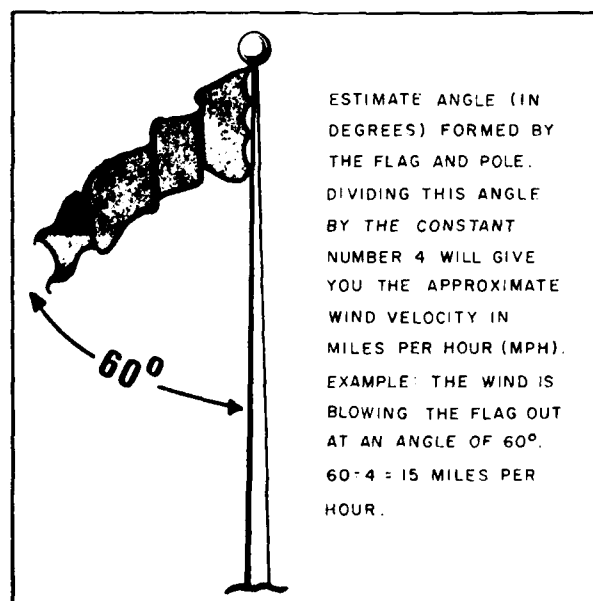
FIRING TECHNIQUES—PISTOL

Good pistol shooting, like rifle shooting, depends upon your ability to master and apply certain basic marksmanship principles. You must practice these principles—aiming, position, and trigger squeeze—often. Apply these fundamentals of marksmanship! If your life ever depends on how well and accurately you shoot the pistol, you can be the one who walks away alive.

Aiming the Pistol

Aiming the pistol consists of combining proper sight alignment with the correct aiming point to obtain a correct sight picture.

SIGHT ALIGNMENT.—Sight alignment is best defined as placing the front and rear sights into correct alignment with the eye. For a correct sight alignment, you must center the front sight



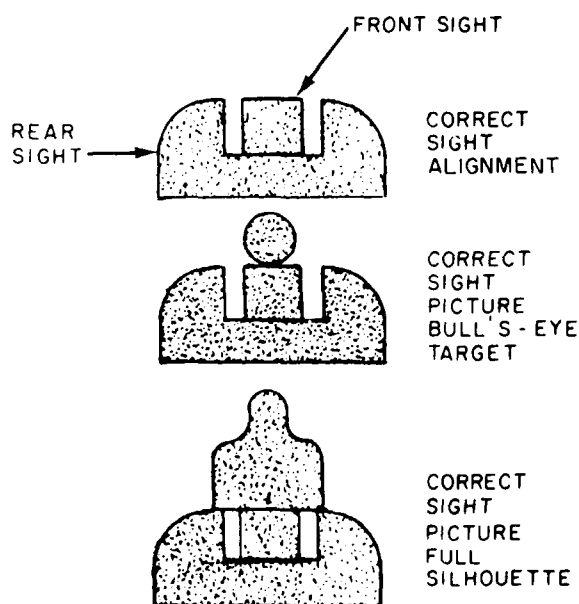
187.61

Figure 4-51.—Estimating wind velocity.

in the rear sight, bringing the top of the front sight exactly level with the top of the rear sight (fig. 4-52). Correct sight alignment is essential for accuracy. It is particularly important with the pistol because of the short sight radius (about 6 1/2-inches). For example, if a 1/10-inch error is made in aligning the front sight in the rear sight, the bullet will miss the point of aim by almost 15 inches at 25 yards of range.

AIMING POINT.—The correct aiming point, when you fire at a bull's-eye target at 25 yards, is a 6 o'clock sight picture. At 15 yards, bring the aiming point well up into the black. When you fire at an E-type silhouette target, the aiming point is in the center of the target.

CORRECT SIGHT PICTURE.—A sight picture is the pattern of the pistol sights in relation to the target as you aim the pistol. A correct sight picture combines correct sight alignment and correct aiming point (fig. 4-52). When you are aiming, your eye cannot focus simultaneously on three objects (rear sight, front sight, and bull's-eye) at different ranges. Therefore, the last focus of the eye should always be on the front sight.



17.53F

Figure 4-52.—Correct sight alignment and sight picture.

You will see the front and rear sights sharp and clear, but the bull's-eye will appear to be a bit hazy. If sight alignment is correct, the bullet will strike the bull's-eye even if the sight picture is partially off the center but still touches the bull's-eye. Since it is physically impossible to hold the weapon perfectly still, you must learn to apply trigger squeeze and to maintain correct sight alignment while the weapon is moving around the bull's-eye. This movement of the pistol is referred to as the "wobble area." You must accept this wobble area, or movement, and endeavor to keep it to a minimum.

Position

To position yourself properly for firing the pistol, you need to know how to grip the pistol correctly and how to position your body in relation to the target. Only the standing position will be covered in this section, because it is the one used in qualification. However, the pistol can also be fired accurately from the kneeling, crouch, and prone positions. The pistol may be gripped with either a one-hand grip or a two-hand grip.

STANDING POSITION ONE-HAND GRIP.—To assume the standing position, using the one-hand grip (fig. 4-53), face the target squarely and then execute an exaggerated half left face (about 50°). Spread your feet about shoulder width apart until you stand comfortably. Your legs should be straight, but not stiff, and your hips should be level. Extend the index finger of your shooting hand and point it at the target. Adjust your stance until your finger points naturally, without muscle tension, at the center of the target. Pick the pistol up with your other hand and place it in your shooting hand. The main spring housing should rest firmly in your palm with the grip safety pressed into the Y formed between the thumb and forefinger. Hold your hand as high as possible on the receiver without squeezing the flesh between the hammer and grip safety.

Grip the receiver firmly with the hand and fingers. Wrap the three lower fingers around the receiver, and place the trigger finger inside the trigger guard. Hold your thumb up and along the side of the pistol with enough pressure to steady the pistol and to equalize any pressure from the other side by the palm and forefinger (fig. 4-54).



Figure 4-53.—Standing position (pistol).

17.51

Once a firm grip is obtained, maintaining the same degree of firmness throughout firing is very important. A change in your grip will change the location of the shot group on the target. A tight grip tends to cause the bullet to strike low and a loose grip to strike high. Keep your trigger finger away from the receiver.

With a proper grip on the pistol, the muscles of your arm should be firm, but not rigid. Your arm should be straight with your wrist and elbow locked. This will prevent excessive up and down movement of the weapon. When the weapon is fired, the recoil will be absorbed through the arm to the shoulder. If you are in the correct position, the pistol will return to approximately the same sight picture after each shot.

STANDING POSITION TWO-HANDED GRIP.—In this position (fig. 4-55), you face the target squarely with your feet placed comfortably about shoulder width apart. Keep your legs straight without stiffness and your hips level and slightly forward. Relax the muscles of your diaphragm, and make no effort to hold in your abdomen.

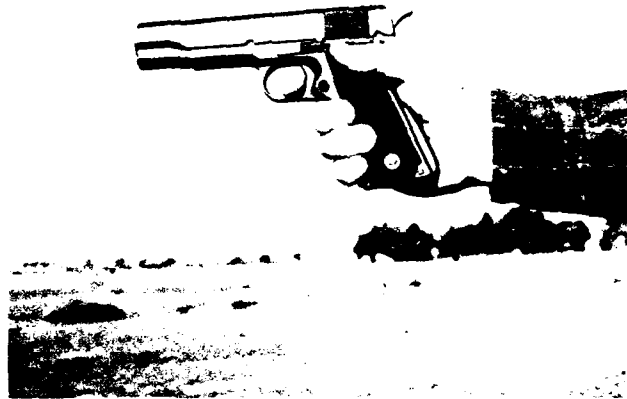


Figure 4-54.—Gripping the pistol (one hand).

17.49

Grasp the pistol in the same manner as if you were firing one-handed. Next, with your free hand extended forward, palm up, place the butt of the weapon into your extended palm. Place the little finger of your shooting hand between the index and middle finger of your other hand. The thumb



Figure 4-55.—Standing position (pistol) two-handed grip.

187.62

of your free hand is straight up alongside the pistol grip with the thumb of your shooting hand locked over top of the other thumb. Bring the last three fingers of your other hand up and over the back of your shooting hand, locking the weapon firmly in both hands (fig. 4-56). Bring the weapon onto the center of the target by shifting your feet.

MISCELLANEOUS.—In both the one-handed and two-handed positions, you position your head so that you are looking straight out through your shooting eye. Keep your shooting arm fully extended.

In the one-handed position, the shoulder of your shooting hand should be slightly raised. Turn your head in order to see the target through the sights. The ease with which your head can be turned is another determining factor in how far you must turn to the right or left. There should be no strain on the neck muscles with your head held upright. The whole position, with the exception of your shooting arm, is one which can be maintained with the least muscular effort. Your body is balanced rather than held in position. The muscles of your shooting arm and shoulder should be tightened somewhat to sustain the weight of the pistol and to maintain a correct grip. Excessive tightening of the muscles of your shooting arm and hand should be avoided. The tension in the muscles of your shooting arm and hand should

be maintained after the hammer falls. This will assist in getting off your second shot quicker.

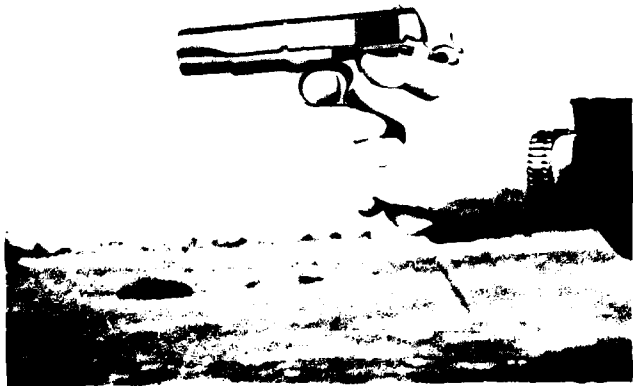
Because of the differences in the body structure of individuals, the standing position will vary slightly. But regardless, your position should be relaxed and comfortable. The pistol should point at the center of the target or you will be tense while firing. If you are tense, there will be excessive muzzle movement.

Trigger Squeeze

Poor shooting is most often caused by disturbing your aim as the bullet is leaving the barrel. This is usually the result of jerking the trigger or flinching. The trigger does not have to be jerked violently to spoil your aim; even a slight off-center pressure of your finger while squeezing the trigger is enough to move the strike of the bullet several inches. **FLINCHING** is a subconscious reflex caused by anticipating the recoil from firing. **JERKING** results from attempting to fire the pistol at the precise time that you align the sights with the target. Both flinching and jerking will cause the bullet to strike the lower left section of the target. An attempt to correct flinching and jerking by tightening the large muscle in the heel of the hand may cause heeling. **HEELING** causes the bullet to strike the target high and to the right. You can correct all these shooting errors by understanding and using the correct trigger squeeze. Improper trigger squeeze will cause more misses on the target than any other single step of preparatory marksmanship training.

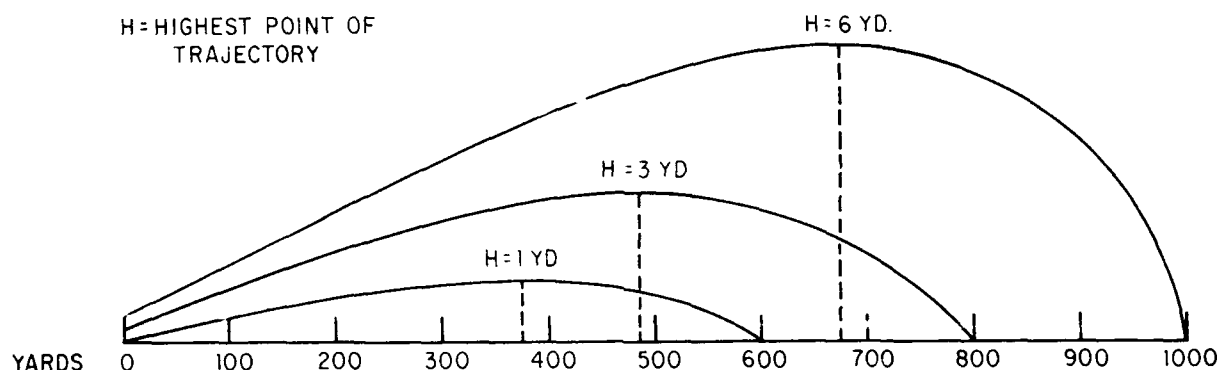
You obtain correct trigger squeeze by applying a uniformly increasing pressure on the trigger straight to the rear without disturbing the sight alignment until the pistol fires. The trigger slack, or free play, is taken up first, and the correct squeeze continues steadily until the hammer falls. If the trigger is squeezed properly, you will not know when the hammer will fall. This is the best way to prevent jerking, flinching, and heeling.

To assist you in squeezing the trigger properly, use the acronym **BRASS** as you did with the rifle. You must, also, learn to call your shots. If you cannot call your shots correctly, you are not concentrating properly on sight alignment and trigger squeeze.



17.55

Figure 4-56.—The two-hand grip.



87.102

Figure 4-57.—Projector of 7.62-mm ammunition showing maximum ordinate (H) of trajectory.

TECHNIQUE OF FIRE

The technique of fire is the application and control of the combined fire of a fire unit. The rest of this chapter concerns the technique of fire for rifle and machine gun units.

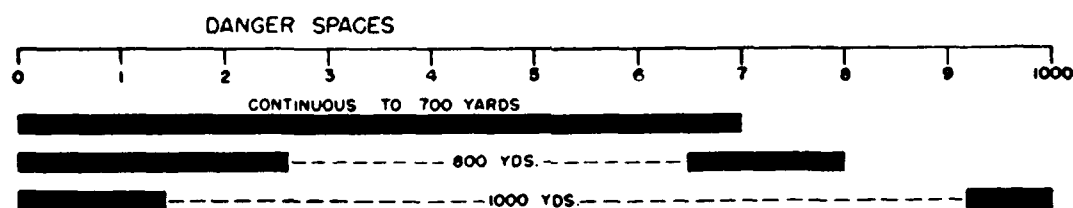
FIRE CHARACTERISTICS

The fire of rifles and machine guns has the following characteristics: trajectory, danger space, burst of fire, dispersion, shot patterns, and beaten zone.

The **TRAJECTORY** is the curved path of the bullet in its flight through the air. Trajectory is influenced by three forces: velocity of the projectile, gravity, and air resistance. The farther the bullet travels, the greater the curvature of its path becomes. The highest point on the trajectory

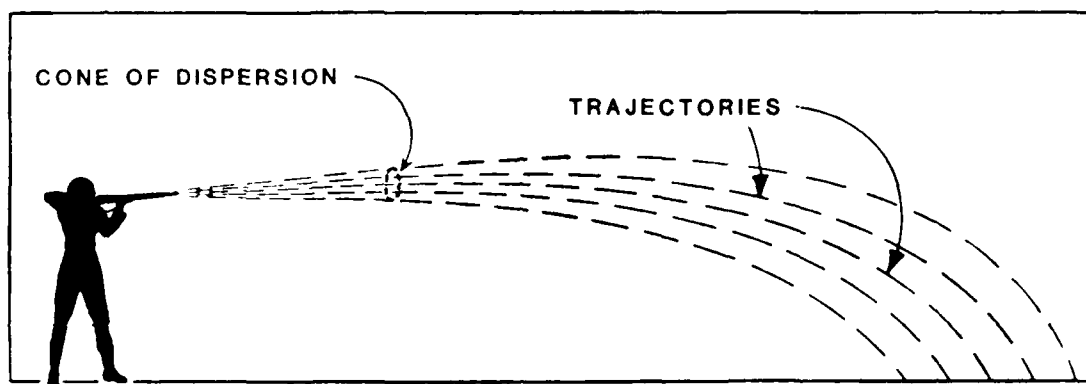
(called the maximum ordinate) is a point at approximately $\frac{2}{3}$ of the range from the weapon to the target (see fig. 4-57).

DANGER SPACE is the area between the weapon and the point of impact in which the bullet does not rise above the average height of a man (presumed to be 68 inches). At ranges up to 750 yards, a rifle bullet fired over level or uniformly sloping ground does not rise above this height; therefore, for such ranges, the danger space is continuous. At ranges greater than 750 yards, a portion of the trajectory is above this height; therefore, the danger space is not continuous but exists for a variable distance in front of the muzzle and in front of the point of impact. In the latter case, the danger space begins again when the bullet comes within 68 inches of the ground. The length of the two danger space zones is dependent upon the range, as shown in figure 4-58.



117.145

Figure 4-58.—Danger space at 1,000-yard range.



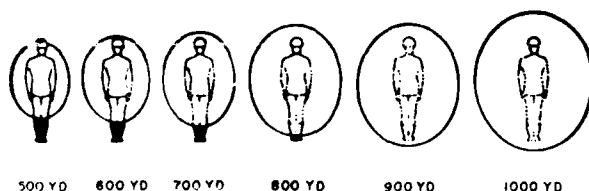
117.146

Figure 4-59.—Cone of dispersion or cone of fire.

A number of shots fired automatically with a single pressure on the trigger is called a **BURST OF FIRE**. For normal ground targets, the number of rounds in a burst is usually from 4 to 10.

When several bullets are fired from a rifle or machine gun held in a fixed position, there is a slight variation in the trajectories. The causes of these differences are in the powder charge, the weight of the bullet, atmospheric and wind conditions, and vibration of the weapon. These variations are known as **DISPERSION**. The several dispersions, plotted in profile, form a cone with its apex to the muzzle of the weapon; this is known as the cone of dispersion or the cone of fire (fig. 4-59).

The impact pattern of the cone of dispersion on a vertical target (which would be oval in shape) is called the **VERTICAL SHOT PATTERN**. (See fig. 4-60.) The impact pattern on a horizontal target, which would be a long, narrow ellipse, is



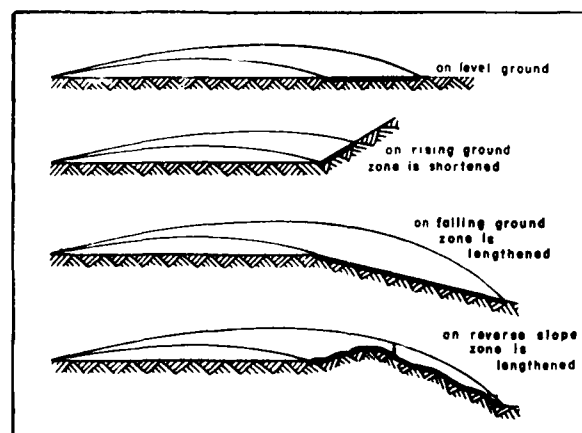
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Figure 4-60.—Vertical shot pattern at various ranges.

RANGE IN YARDS	TABLE OF APPROXIMATE EFFECTIVE BEATEN ZONES ON LEVEL GROUND
500	150 YDS. LONG-1 YD. WIDE
1000	90 YDS. LONG-2 YDS. WIDE
1500	65 YDS. LONG-3 YDS. WIDE
2000	55 YDS. LONG-4 YDS. WIDE

117.148

Figure 4-61.—Horizontal shot patterns at various ranges.



117.149

Figure 4-62.—Effect of ground slopes on beaten zone.

known as the HORIZONTAL SHOT PATTERN or BEATEN ZONE. (See fig. 4-61.)

The BEATEN ZONE is the area of the ground the bullets strike. The size and shape of the beaten zone depend upon the range and slope of the ground, as shown in figure 4-62.

CLASSES OF FIRE

Fire is classified with respect to the target, the ground, and the gun. (See figs. 4-63 through 4-65.)

Fire with respect to the target may be **FRONTAL** (delivered perpendicular to the enemy

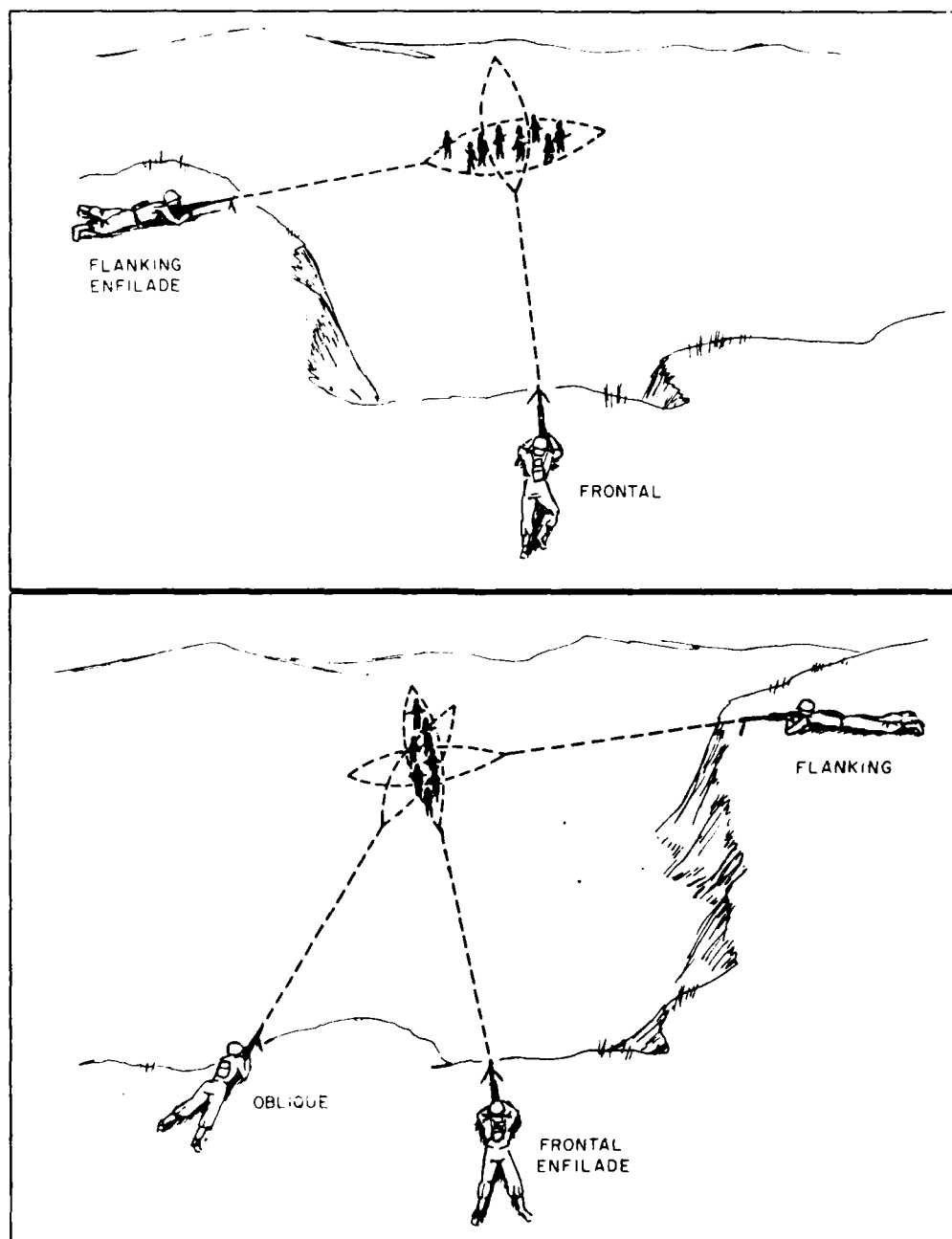
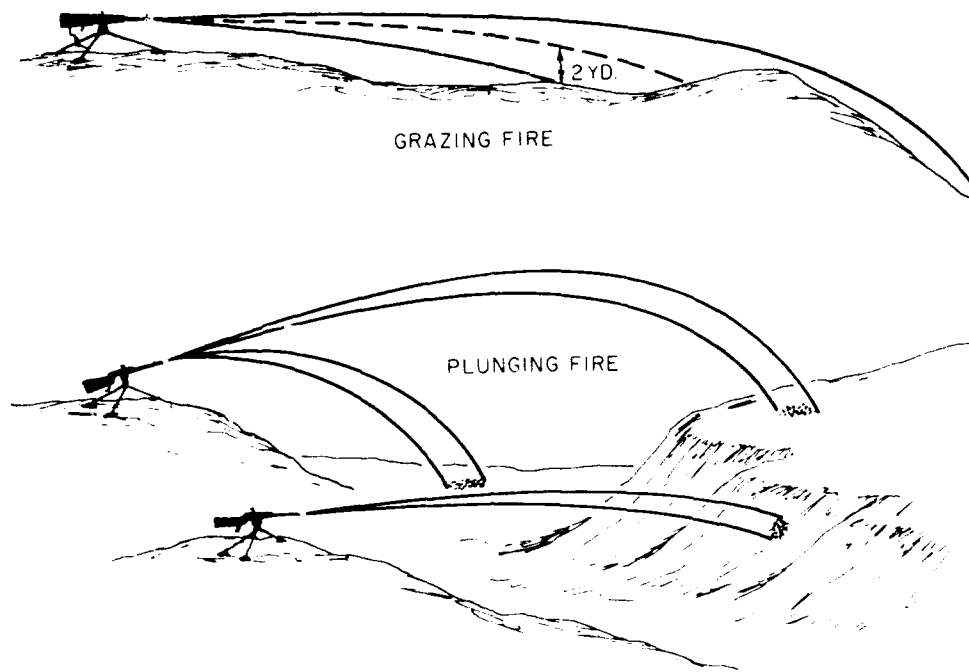
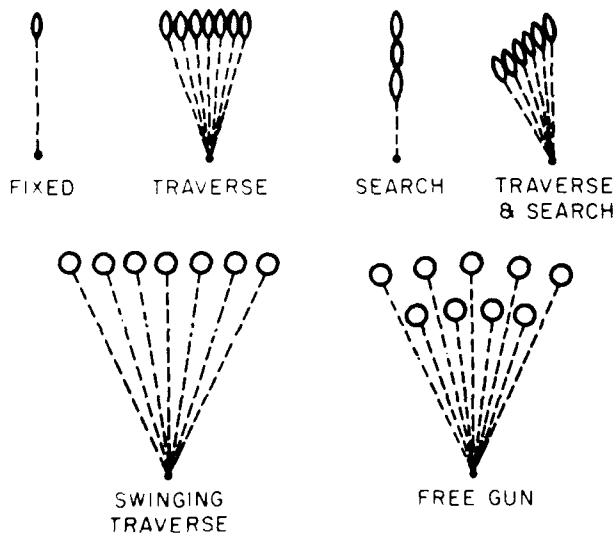


Figure 4-63.—Fire in respect to the target.



187.88

Figure 4-64.—Fire in respect to the ground.



187.89

Figure 4-65.—Fire in respect to the gun.

front), **FLANKING** (delivered perpendicular to the enemy flank), or **ENFILADE** (delivered so that the long axis of the beaten zone corresponds with the long axis of the target). **ENFILADE** fire may be either frontal or flanking, depending on the direction of the long axis of the target. Since it makes maximum use of the beaten zone in relation to the shape of the target, enfilade fire is the most effective. Fire delivered from a direction that is neither frontal nor flanking is called **OBLIQUE** fire.

Fire with respect to the ground can be classified as grazing, plunging, or overhead.

- **GRAZING** fire has a trajectory not higher than 68 inches above the ground. Grazing fire can exist for 750 yards over level or uniformly sloping ground.

- **PLUNGING** fire strikes the ground from above at a considerable angle. The danger space of plunging fire is practically limited to the beaten zone.

- **OVERHEAD** fire is delivered over the heads of friendly troops. It must usually be high trajectory, plunging fire.

Fire with respect to the machine gun may be fixed fire, searching fire, traversing fire, or combined traversing and searching fire, swinging traverse fire, and free gunfire.

- **FIXED FIRE** is delivered against targets that only require a single aiming point. The depth of the beaten zone must be large enough to include the target. Fixed fire is continuous as long as any portion of the target remains in the zone of fire.

- **SEARCHING FIRE** is distributed in depth by successive changes in the elevation of the gun. Searching fire is used against targets too deep to be included in the beaten zone of fixed fire. A burst of fire is delivered after each change in elevation.

- **TRAVERSING FIRE** is distributed in width by successive changes in the horizontal direction of the gun. A burst of fire is delivered after each change or during the swing.

- **COMBINED TRAVERSING AND SEARCHING FIRE** is distributed both in width and depth and by changes in both elevation and horizontal direction.

- **SWINGING TRAVERSE FIRE** is delivered against targets too wide to cover with

the traversing handwheel. Also, it is used against targets that are moving so rapidly across the gunner's front that he cannot maintain effective fire while using the traversing handwheel.

- **FREE GUNFIRE** is delivered from the tripod mount against a target requiring rapid, major changes in direction and elevation that cannot be made with the traversing and elevating mechanism. Free gunfire can also be used from a vehicular mount against a target that cannot be adequately covered by selecting a series of aiming points.

All types of fire can be delivered with bipod-, tripod-, or vehicular-mounted guns except as follows: Swinging traverse fire cannot be delivered with bipod- or vehicular-mounted guns; free gunfire cannot be delivered with bipod-mounted guns.

OVERHEAD FIRE

Overhead fire with the rifle is safe when the ground affords protection to friendly troops or when the troops are far enough below the line of fire (fig. 4-66). Whether or not overhead fire should be used in any particular case is a matter of judgment.

A machine gun on a tripod is capable of delivering accurate overhead fire because of the small, uniform dispersion of the cone of fire. In the attack, the use of overhead fire permits the

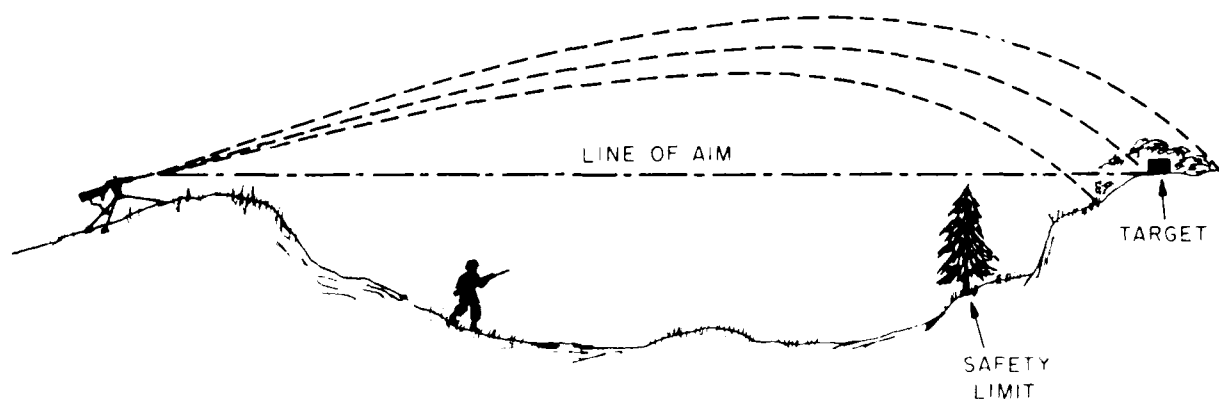


Figure 4-66.—Delivering of overhead fire.

machine gun to support the advance of the rifle units. To permit overhead fire on any target, the cone of fire must pass over the heads of friendly troops by a certain distance, called the **MINIMUM CLEARANCE**. There are two rules by which the prescribed minimum clearance may be determined: the **GUNNER'S RULE** for ranges up to 900 yards, and the **LEADER'S RULE** for ranges greater than 900 yards. Overhead fire will not be delivered by use of these rules at ranges less than 400 yards or greater than 1,800 yards.

The steps in using the **GUNNER'S RULE** are the following:

1. Lay the gun on the target with the correct sight setting to hit the target.
2. Without disturbing the lay of the gun, set the rear sight at 1,500 yards.
3. Look through the sights and note the point where this new line of aim strikes the ground. If this point is beyond the feet of friendly troops, you may deliver overhead fire safely until the troops reach this point. It is not safe to fire when they pass this point.

Steps in the application of the **LEADER'S RULE** are as follows:

1. Select a point on the ground to which you believe friendly troops can advance with safety.
2. Determine the range to this point by the most accurate means available.
3. Lay the gun on the target with the correct sight setting to hit the target.
4. Without disturbing the lay of the gun, set the rear sight at 1,500 yards or at the estimated range to the point plus 600 yards, whichever is greater. Under no condition should the sight setting be less than 1,500 yards.
5. Note the point where the new line of aim strikes the ground. If it strikes at the selected point, that point marks the limit of safety.
6. If the new line of aim strikes the ground short of the selected point, troops can advance safely to the point where the line of aim strikes the ground and to an unknown point beyond. If you desire to fire after friendly troops advance farther than the point where the line of aim strikes the ground, you must determine this farther point by testing new points until the line of aim and the selected point coincide.

RANGE ESTIMATION

In combat, you seldom know ranges in advance. To bring effective fire to bear on the enemy, riflemen and machine gunners must be trained to estimate ranges quickly and accurately. Ranges are estimated either by eye or by observation of fire.

ESTIMATION BY EYE is the usual method of estimating range in combat. You accomplish this by mentally applying a unit of measure to the distance to the target. This unit is normally 100 yards. You need to be familiar with the appearance of this unit of measure at various distances and over varying types of terrain to be able to use this method effectively when estimating ranges by eye.

Eye estimation is difficult to apply for ranges of more than 500 yards. When the range exceeds 500 yards, estimate a point halfway to the target; then, double the estimate.

When much of the ground between the observer and the target is hidden, eye estimation is difficult. In some cases you may overcome this difficulty by the use of a **MENTAL ARC**. Move your gaze in a mental arc to the right or left of the target. Find a prominent object at about the same range as the target, and use it to estimate this range.

When none of the previously described methods are feasible, you may possibly estimate the range by the appearance of objects. Conditions of light, atmosphere, color, and terrain affect the apparent distance of objects.

Accurate estimation of ranges by eye requires considerable practice over all types of terrain and under all conditions of visibility. The use of known distance ranges, marked off in 100-yard intervals, is recommended for initial training.

Range estimation of **OBSERVATION OF FIRE** is determined by observing the flight of tracer bullets or by observing the points where projectiles strike.

Tracer bullets leave a red trail for about 950 yards of their flight. The shooter first estimates the range by eye to determine the initial sight setting. Thereafter, by watching the strike of the tracer bullets, he corrects the sight setting to hit the target.

When you are in suitable terrain, watch a projectile strike the ground. If it kicks up dust

or other visible material, follow the same procedure as you would with tracers.

FIRE DISCIPLINE

Fire discipline is the state of order, coolness, efficiency, and the obedience existing among troops in a firefight. It implies the careful observance of instructions in the use of weapons in combat and the execution of the exact orders of the leader. To have effective fire discipline, it must be controlled by leaders. The responsibility for fire discipline in the platoon rests with the platoon commander, assisted by his subordinates. The squad leader maintains discipline in the squad. There is a tendency for untrained machine gunners and riflemen to open fire at night when hearing noises and on seeing imaginary targets. This is dangerous and wastes ammunition; but more important, it gives the position away. Also, the enemy could stand off and send a couple of scouts in to fire several shots or to throw some grenades at the defensive positions to draw responsive fire. If the fire discipline is poor, the defenders return the fire. The enemy can then plot the locations of the defense positions, plan an attack to avoid strong points, or direct supporting fire accurately on the defenders. The squad leader is responsible for controlling these tendencies in his squad.

FIRE CONTROL

Fire control includes all operations connected with the preparation and actual application of fire to a target. Fire control implies the following abilities of the leader:

- To have his unit open fire the instant he desires
- To adjust the fire of his weapons on the target
- To shift fire from one target to another
- To regulate the rate of fire
- To cease firing at will

Lack of proper fire control causes the loss of the surprise effect, premature disclosure of the position, misapplication of fire on unimportant targets, and waste of ammunition. **DISCIPLINE** and **CORRECT TECHNICAL TRAINING** are fundamental in ensuring fire control.

The platoon commander's order to his section of squad leaders assigns a mission to each section or squad; gives the firing position area each squad will occupy and the targets it will engage; or the sector of fire it will cover. In addition, he frequently prescribes the technique to employ in engaging targets.

The section or squad leader's order prescribes the location for each weapon, the targets, and the technique to be employed. In the absence of orders from the next higher commander, the platoon, section, or squad leaders regulate opening fire and lifting, shifting, and rate of fire.

FIRE DISTRIBUTION

The distribution of fire, to be effective, must be over the *entire target*. Improper distribution results in gaps between zones and allows a part of the enemy to escape, to advance, or to use their weapons without effective opposition.

Rifle Fire

The fire of a rifle unit is either concentrated or distributed. The nature of the target, as given in the fire order, will determine in each rifleman's mind the type of fire to use.

● **CONCENTRATED FIRE** is directed at a single point. Enemy machine guns, bunkers, and heavy weapons are examples of suitable targets for concentrated fire.

● **DISTRIBUTED FIRE** is fire distributed in width for the purpose of keeping all parts of a larger-than-point target under effective fire. Each rifleman fires his first shot at that portion of the target corresponding generally to his position in the squad. He then distributes his succeeding shots over that part of the target extending a few yards right and left of the point of aim for his first shot. The width of target he will cover will be the maximum on which he can

deliver accurate fire without changing his position, as shown in figure 4-67.

In **PLATOON FIRING**, unless otherwise ordered, each squad completely covers the target designated for the platoon. This enables the leader to shift part of his fire to a new target or to remove a squad from the line without leaving a portion of the target not under fire. If the platoon leader does not desire each squad to cover the entire platoon target, he assigns definite sectors of fire to each squad.

In **DETERMINING EXTENT OF TARGET**, it is difficult or impossible to pick out visually each individual enemy in either a dug-in or camouflaged position. A muzzle blast may show the location of a few individual positions, but many positions will be too well camouflaged to see. However, engaging the whole target is imperative in order to inflict decisive casualties and neutralize the enemy's fire. Pinning down only the obvious positions and allowing the remaining enemy to fire unmolested does little good.

Under these circumstances, to effectively apply the proper fire distribution, the unit leader must first determine the locations of the enemy's flanks. The flanks may be obvious and easy to see. They may be limited by natural features, such as woods, a cliff, or a gully; or they may be approximately located from the direction and sound of the enemy's firing.

After determining the enemy's flanks, the squad leader must designate the portion of the target, whether in part or in its entirety, that he wishes his squad to engage. This can best be done by using tracers fired on either flank. The squad then opens fire using the normal fire distribution.

Machine Gun Fire

In fire control terminology, target width is designated in mils. A MIL is a unit of angular measurement; there are 1600 mils in 90 degrees. Gun angles of train and elevation are measured in mils. A target width of 50 mils has no relationship to the actual width of the target. This expression simply means that moving the gun

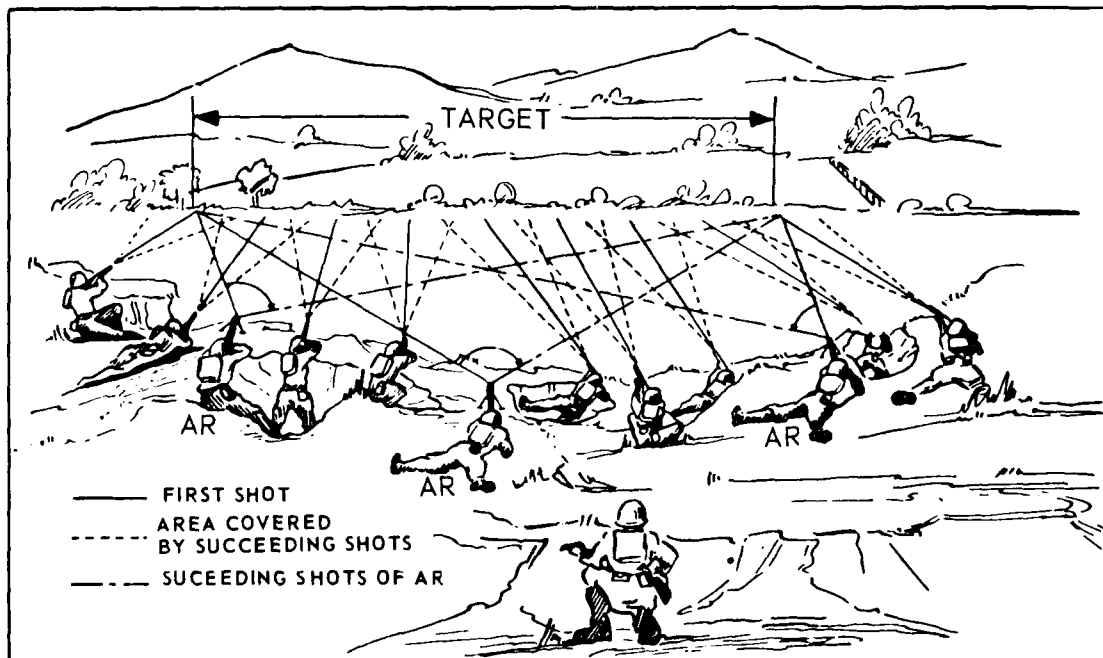


Figure 4-67.—Fire distribution by individuals of the rifle squad.

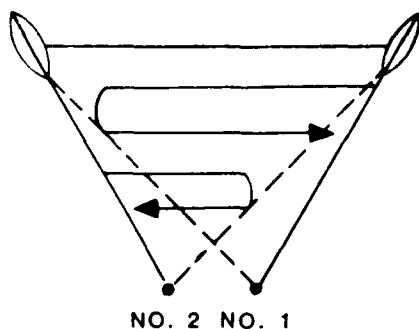
through a train (horizontal angle) of 50 mils will cover the entire target front. Thus, a very wide target could have a target width of 50 mils at long range, while a very narrow target would have the same width at much shorter range.

No fixed rule about the maximum width of a target that a single gun may profitably engage can be given. But preferably targets for light machine guns should be less than 50 mils in width. The section (two guns) is the machine gun fire unit. Whenever practical, both guns cover the same target area, although an occasion may arise to employ single guns profitably. Assigning both guns to a single target area ensures continuous fire should either gun be put out of action, provides a greater volume of fire on the target, and reduces the time required to cover the target.

Targets having a width or depth no greater than the beaten zone of the weapon engaging them are considered POINT targets. You should engage point targets with fixed fire. The command for such fire is FIXED. Gun crews are trained to follow any movement or change in formation made by the enemy after the initial burst of fire.

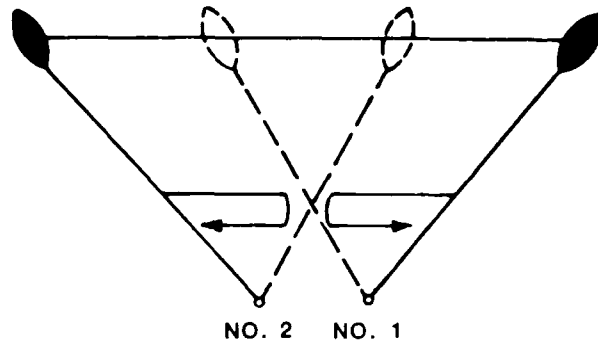
When sections engage frontal targets that are less than 50 mils wide and less than the length of the beaten zone in depth, the leader uses the normal traversing method. Each gun lays just outside its corresponding target flank and traverses across the target front to a point just outside the opposite target flank (fig. 4-68). The command for this type of fire is TRAVERSE.

When the target measures 50 mils or more in width and is less than the length of the beaten zone



117.155

Figure 4-68.—Traversing method by section. Both flanks are visible to the gunners. Target is less than 50 mils in width.



117.156

Figure 4-69.—Traversing method by section. Targets 50 mils or more in width. (Each gun assigned a portion of the target).

in depth, the leader assigns a portion of the target to one gun and the remainder to the other. Each gun lays on the outside flank of its assigned portion, and traverses back and forth across the portion assigned. (See fig. 4-69.) The command would be, for example: No. 1 gun, RIGHT HALF; No. 2 gun, LEFT HALF; TRAVERSE.

If the flanks of the target cannot be seen, the leader should order each gun to traverse so many mils from a point between the flanks. The designated number of mils should be large enough for each gun to traverse to a point beyond the suspected position of the flank.

Searching fire covers targets deeper than the length of the beaten zone. If the target is stationary, has limited mobility, or is moving slowly toward you and if the ends are visible, No. 1 gun lays on the near end and searches down. If the estimated depth of the target is 200 yards or less, the leader announces the range for both guns to the middle of the target. If the estimated depth of the target is more than 200 yards, he announces the range to the near end for No. 1 gun and the range to the far end for No. 2. The command for this type of fire is SEARCH.

If the target is moving rapidly toward the guns, both guns lay on the near end with the range to that point and search up. If the target is moving rapidly away from the guns, both guns lay on the far end and search down. The distribution element of the command for covering a rapidly approaching or receding target is ALL GUNS, NEAR (FAR) END, SEARCH.

FIRE COMMANDS

The leader of a fire unit, after making the decision to fire on a target, must give instructions about how to engage the target. He gives these instructions in the form of a fire command. A fire command for machine guns contains four basic elements: the ALERT, the TARGET, DESIGNATION, the METHOD OF FIRE, and the command to OPEN FIRE. Examples of the four elements are given below:

1. The alert designates the gun crew that is to fire and alerts them to receive the command. The alert includes the following:

Gun crew to fire.—FIRST SECTION

Target alert.—FIRE MISSION, with STATIONARY TARGET, MOVING TARGET, or other additional necessary information.

2. The leader gives the target designation as follows:

Direction.—FRONT

Target description.—COLUMN OF TROOPS

Range.—FIVE FIVE ZERO (yd)

3. He designates the method of engaging by naming the method, such as TRAVERSE. The rate of fire is a part of the method of fire. The leader states the amount of fire to place on the target, such as 75 ROUNDS PER MINUTE or MEDIUM RATE.

4. The command to open fire is COMMENCE FIRING or FIRE. When a large volume of sudden surprise fire is desired, the leader may preface the command with the preparatory command, ON MY COMMAND. The unit leader then waits until all gunners have located the target and aimed before giving the command of execution.

Fire control will also include any necessary adjustment corrections for machine guns, as RIGHT TWO ZERO MILS, ADD THREE MILS.

A fire command for riflemen and automatic riflemen contains six basic elements: the alert, the direction, the target description, the range, the target assignment, and the fire control.

The ALERT brings the unit to a state of readiness to receive further information. If all men in the unit are not to fire, the command also designates those who are to fire. If all men are to fire, the command for the alert is SQUAD. If only certain men are to fire, the names of the men are stated after the word SQUAD.

The DIRECTION element tells the riflemen the target direction. It may be given orally, such as RIGHT FRONT or by pointing or firing in the direction of the target. If the target is not readily visible, a reference point may be used. A reference point is some prominent terrain feature, either natural or artificial, to use to make the target easier to locate. The reference point should be well-defined and easily recognized. If possible, the point should be on a line with, and beyond, the target because, in this position, it is a more accurate reference for a number of men firing from separate positions.

For the sake of brevity, the leader designates the reference point by the single word REFERENCE, followed by a description of the point, such as FARM HOUSE ON HORIZON. He should give the distance right or left. He may give this distance in FINGER MEASUREMENTS in which the method to use is as follows:

1. Extend your arm full length with the palm up. Point the appropriate number of fingers, beginning with the index finger, vertically to the reference point. (See fig. 4-70.)

2. Close one eye, sight along the outside of the index finger so that one edge is on the reference point. Use the other edge of the appropriate number of fingers (one, two, three, or four) to locate the hidden target. When this method is used the command will sound like—

FROM REFERENCE POINT

MOVE LEFT THREE FINGERS

FIRE WHEN READY

TARGET DESCRIPTION should be brief and accurate. A target may be POINT, such as

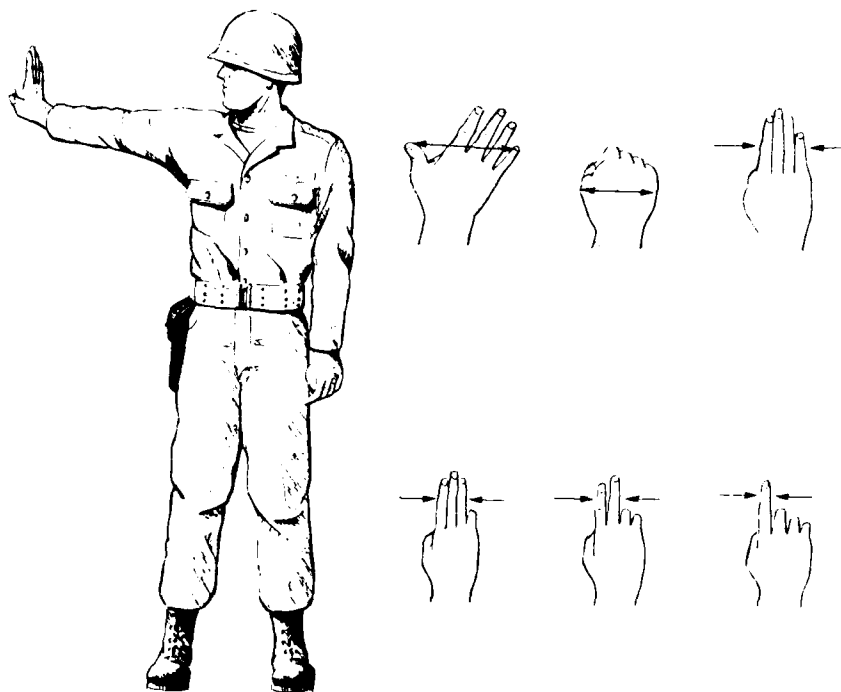


Figure 4-70.—Measurement of angles by hand and fingers.

187.177

a machine gun, LINEAR, such as a line of skirmishers, or AREA, such as men dispersed through a clump of woods.

RANGE may be announced orally or indicated by arm-and-hand signals.

TARGET ASSIGNMENT designates who is to fire at the target. If the whole unit has been alerted and if the leader desires that they all fire, then target assignments may be eliminated.

The FIRE CONTROL element normally consists of the command, COMMENCE FIRING or FIRE, plus any designation the leader desires about rate of fire, such as QUICK FIRE, FIRE FASTER, FIRE SLOWER.

The following is an example of a simple fire command:

SQUAD

RIGHT FRONT

SNIPER ON ROOF OF FARM-
HOUSE

TWO HUNDRED

JONES AND SMITH

COMMENCE FIRING

An example of a fire command using a reference point and finger measurements is the following:

LEFT FRONT

REFERENCE: WHITE CHURCH
SPIRE

ON HORIZON, RIGHT THREE
FINGERS

TARGET: MACHINE GUN IN
BUSHES

THREE HUNDRED

TEAMS ONE AND TWO

COMMENCE FIRING

APPLICATION OF FIRE

Application of fire consists of placing the fire of a unit on the desired target at the proper time and the control of the fire after that. Accurately controlled fire on the enemy has both a physical (casualty producing) and a morale effect.

FINAL PROTECTIVE LINES

A final protective line is a predetermined line where interlocking bands of grazing fire are placed in order to stop enemy assaults. The elevation and direction of the fire are fixed and capable of being delivered under any condition of visibility.

Because of irregularities in the terrain, fixed machine gun fire cannot always produce the maximum effective grazing fire. Then, the leader employs rifle fire to ensure that all the final protective lines are covered.

Fire on the final protective line during periods of good visibility is aimed and adjusted fire. Under such conditions, the section leader will generally determine the rate of fire and may also give the order to cease firing.

Under conditions of poor visibility, the battalion order may prescribe the rates of fire. In the absence of instructions, the usual rate of fire for a section on a final protective line is the rapid rate for the first 2 minutes, then the medium rate until ordered to cease firing.

CHAPTER 5

ORGANIC SUPPORT WEAPONS: M203, LAW, AND MACHINE GUNS

This chapter will continue the discussion of weapons, but you will learn about the support weapons available to the SEABEES. You will be given information on the 40-mm grenade launcher, M203; the M60 machine gun; the .50-cal. Browning machine gun; and the 66-mm light antitank weapon M72 (LAW).

THE 40-MM GRENADE LAUNCHER, M203

When equipped with the grenade launcher, the M16A1 rifle becomes the 40-mm grenade launcher, M203, and loses its identity as the M16A1 rifle.

The launcher attachment is assembled by a qualified armorer only. As a member of a weapons platoon, you only have the responsibility of the employment, trajectory, method of firing, firing effects, malfunctions, and care and cleaning of the launcher attachment.

The 40-mm grenade launcher, M203, mounted on the M16A1 rifle is shown in figure 5-1. It is a lightweight, compact, breech-loading, pump-action (sliding-barrel), single-shot, manually operated weapon.

The launcher is approximately 16 inches in overall length; it weighs approximately 3.6 pounds loaded and 3 pounds unloaded. Its maximum range is 400 meters, its area target range is 350 meters, and its point target range is 150 meters. The grenade launcher

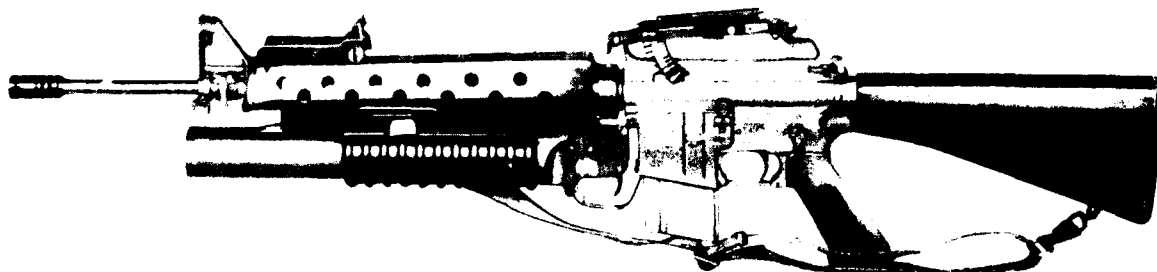


Figure 5-1.—The 40-mm grenade launcher, M203, mounted on the M16A1 Rifle.

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controls and their identifications, as shown in figure 5-2, will be discussed in the sections that follow.

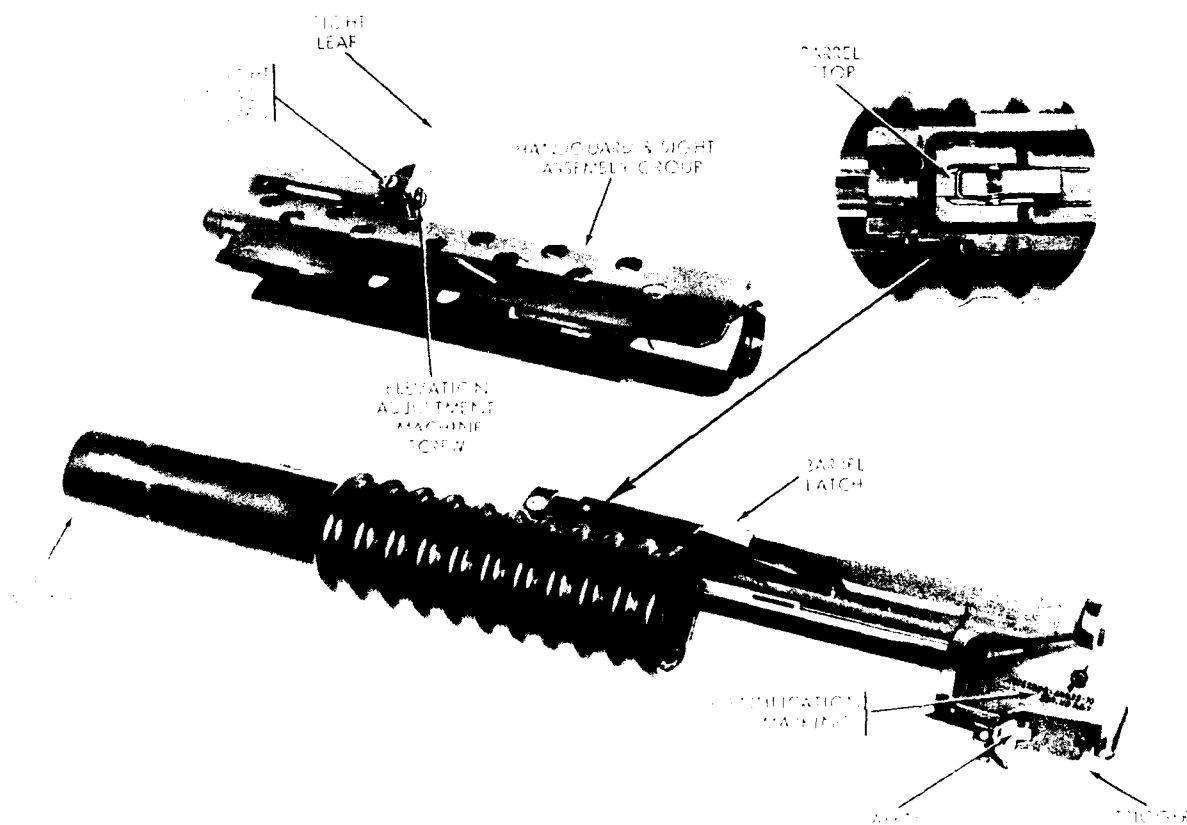
HANDGUARD AND SIGHT ASSEMBLY GROUP

The handguard portion of the assembly group is a molded plastic protective cover that fits over the barrel of the M16A1 rifle. The cover prevents the operator from coming in contact with the barrel when it becomes heated from rapid firing. The heat produced by the rifle barrel dissipates through the cooling holes and slots in the cover. The protruding plastic tab on the left side of the cover prevents the barrel latch of the grenade launcher from being accidentally pressed when the weapon is laid on its side.

The sight leaf portion of the assembly group is a metallic folding blade sight. It provides range selection from 50 to 250 meters in 50-meter

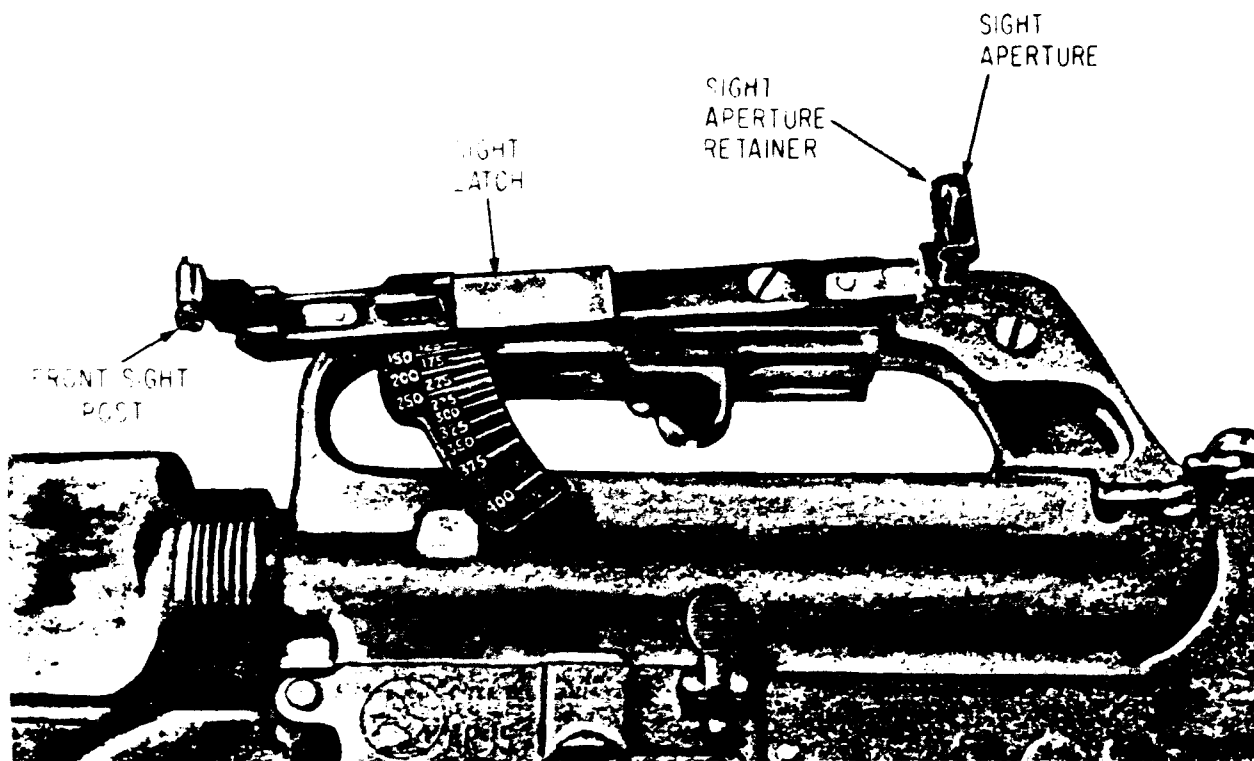
increments. The windage adjustment screw moves the blade element horizontally to provide windage adjustment capabilities. The elevation adjustment machine screw, when loosened, allows the blade element to be moved vertically, providing elevation adjustment capabilities.

The M203 also has a quadrant sight assembly (fig. 5-3) which connects to the carrying handle of the M16 rifle. It consists of a sight arm, a range selection quadrant, and mounting brackets. The sight arm contains an aperture and post for sighting operation of the launcher. The range selection quadrant has embossed range graduations from 50 to 400 in 25-meter increments. The quadrant sight is used at ranges in excess of 250 meters that the leaf sight does not cover. The 25-meter increments also allow for better accuracy at a greater number of range variations than the leaf sight. For installation and removal of the quadrant sight see figure 5-4. For



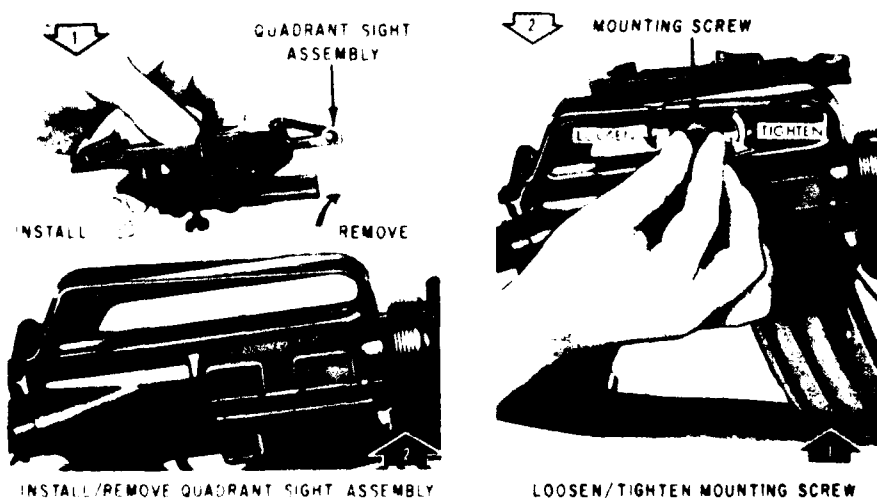
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Figure 5-2.—The 40-mm grenade launcher, M203, controls, and their identifications.



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Figure 5-3.—Quadrant sight assembly.



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Figure 5-4.—Installation/removal of quadrant sight assembly.

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elevation adjustment, turn the front sight post to the right to decrease elevation and to the left to increase elevation.

NOTE: On elevation adjustment, 1 notch equals 5 meters at 200 meters.

For windage adjustment, press the rear sight retainer and move the aperture away from the barrel to move the trajectory of the projectile to the left. Move the aperture toward the barrel to move the trajectory to the right.

NOTE: On windage adjustment, 1 notch equals 1.5 meters at 200 meters.

BARREL ASSEMBLY

The barrel of the barrel assembly is constructed of specially treated and machined aluminum. The barrel extension is a rectangular, chrome-plated steel bar. It attaches to the barrel and provides a means of attaching the barrel to the receiver assembly. The handgrip is a molded plastic corrugated sleeve. When the grenade launcher is being fired, the plastic handgrip allows the operator to hold the launcher without any discomfort from the heat.

RECEIVER ASSEMBLY

The receiver assembly consists of an aluminum receiver that houses the barrel latch, the barrel stop, and the firing mechanism. The receiver assembly attaches to the barrel of the rifle, thereby mounting the grenade launcher to the rifle. The receiver assembly also contains the follower assembly, the trigger, and the safety components that serve to fire or prevent accidental firing of the grenade launcher.

BARREL AND BARREL LATCH

The barrel latch, when depressed, unlocks the barrel so that it can be moved forward along the receiver assembly. As the barrel and barrel extension, which are interlocked with the cocking lever, move forward, the cocking lever is forced downward. The cocking lever, in turn, forces the spring-loaded firing pin rearward. At the same time, the spring-loaded follower follows the barrel

extension forward. As the barrel continues its forward movement, the barrel extension disengages from the cocking lever; the movement of the follower is restricted by the receiver; the follower holds the cocking lever in the down position. When the barrel is moved rearward, the follower is driven rearward; the cocking lever again engages the barrel extension, and the firing pin moves slightly forward and engages the sear.

BARREL STOP

The barrel stop limits the forward motion of the barrel assembly. This prevents the barrel assembly from sliding off the receiver assembly barrel track during loading and cocking operations. When depressed, the barrel stop allows the barrel assembly to be removed from the receiver assembly for maintenance purposes.

CLEARING THE GRENADE LAUNCHER

Before clearing the launcher, be sure to point the muzzle clear of all other personnel within the area. Press the barrel latch and slide the barrel forward until the barrel stop is engaged. Inspect the chamber for the possible presence of a round, expended casing, or other obstruction, and remove if any is present. Be sure the barrel, bore, and chamber are wiped dry with a clean cloth after checking and before firing.

LOADING PROCEDURES

Press the barrel latch and slide the barrel assembly forward until the barrel stop is engaged. Insert a cartridge into the chamber; slide the barrel assembly rearward sharply until the barrel locks; and then move the safety rearward.

FIRING PROCEDURES

The grenade launcher may be fired from any of the following positions: prone, sitting, kneeling, or standing. For all positions, the firing procedures are as follows:

1. With the grenade launcher loaded, position the weapon and sight.
2. Move the safety to the fire position.

3. Place the butt of the stock firmly against your shoulder. In firing long range from the prone position, place the butt of the stock firmly on the ground. Take aim and squeeze the trigger to fire the weapon.

WARNING: When firing high explosive (HE) rounds at targets within leaf sight ranges of 50 to 80 meters, you will be in a protected position. Also, targets within an 80-meter radius of unprotected friendly troops should not be engaged. The danger radius of practice rounds is 20 meters. In addition, observe precautions and warnings pertaining to the type of ammunition being used.

LEAF SIGHT ZEROING PROCEDURES

To zero-in the grenade launcher leaf sight, you should set up a target at 200 meters. Remember not to perform these procedures at ranges less than 100 meters. The 50-meter mark on the leaf sight blade is marked in red to emphasize that this range is *not* to be used in the zeroing-in procedures.

Be sure to perform the before-firing preventive maintenance services and the loading procedures as specified. Place the leaf-sight blade of the weapon in the upright position. Choose your firing position, preferably a supported prone position. Align the target with the appropriate range increment of the leaf sight blade and the front post sight of the rifle. Fire the weapon, using the firing procedures given. Make any applicable windage or elevation adjustments.

NOTE: Turning the sight windage screw clockwise moves the leaf sight to the left. Raising the leaf sight increases the range, and lowering the leaf sight decreases the range.

When you must adjust for wind, each increment turn of the windage screw equals a 1 1/2-meter adjustment when you are firing on the 200-meter range.

When you must adjust for elevation, each increment turn of the elevation adjustment machine screw equals a 10-meter adjustment when you are firing on the 200-meter range.

Fire three rounds and make the necessary adjustments after each round. When three

consecutive rounds land within 5 or 10 meters of the target, the zeroing-in procedures are complete.

MISFIRE, HANGFIRE, AND STOPPAGE

A MISFIRE is a complete failure to fire because of a mechanical failure, *not* a delay in firing like a hangfire. It is not dangerous, but it must be treated as a hangfire (which is dangerous) until such possibility has been eliminated.

A HANGFIRE is a delay in the functioning of the propelling charge. Wait 30 seconds from the time the charge fails to fire before opening the breech for unloading procedures. Caution is required, as this can be very dangerous. Clear the area of all personnel not needed to correct the hangfire.

A STOPPAGE is any interruption in the cycle of operation caused by faulty action of the weapon or ammunition.

When a weapon fails to fire, the possibility of a misfire or hangfire exists. Therefore, the following precautions must be observed until the round has been removed from the weapon and the cause of the failure determined.

1. Keep the weapon trained on the target and be sure all personnel are clear of the muzzle.
2. Wait 30 seconds from the time the weapon fails to fire before opening the breech for unloading.
3. Exercise extreme caution during unloading procedures; where circumstances permit, either catch the ejected round or reduce the distance of free fall to the ground.
4. After the round has been removed from the receiver, store it separately until you determine whether the round or the firing mechanism is defective. If the round is defective, it must be kept separated from other rounds until it can be disposed of properly. If examination reveals that the firing mechanism is defective, the round may be reloaded and fired after the firing mechanism has been repaired by the armorer.

UNLOADING THE LAUNCHER

To unload the launcher, press the barrel latch and move the barrel forward. The expended casing is automatically extracted and ejected.

CLEANING AND LUBRICATION AFTER FIRING

Clean dust, dirt, and mud from all surfaces of the handguard assembly, the sight assembly, and the receiver assembly with a clean dry cloth. Remove powder fouling from the heat shield of the handguard using rifle bore cleaner (RBC). Wipe the inside of the barrel with a cloth soaked in rifle bore cleaner. Remove any deposits or residue inside the barrel by using a bore brush.

Press the barrel latch and move the barrel forward until the barrel stop is engaged. Lubricate the barrel assembly track by applying a light coat of semifluid lubricating oil recommended by the armorer. Wipe all exposed metal surfaces with a cloth saturated with the recommended lubricant. Touch up any scratched or worn surfaces with a solid film of lubricant. Before applying the lubricant, wipe the surfaces with a dry-cleaning solvent to ensure they are thoroughly cleaned of all foreign matter. Separate the upper and lower receiver groups on the rifle. With the launcher cocked, remove the back plate and follower, flush inside the trigger housing with rifle bore cleaner, wipe dry, and lubricate with the recommended lubricant. This action should be done only under the supervision of an armorer.

GRENADE LAUNCHER AMMUNITION

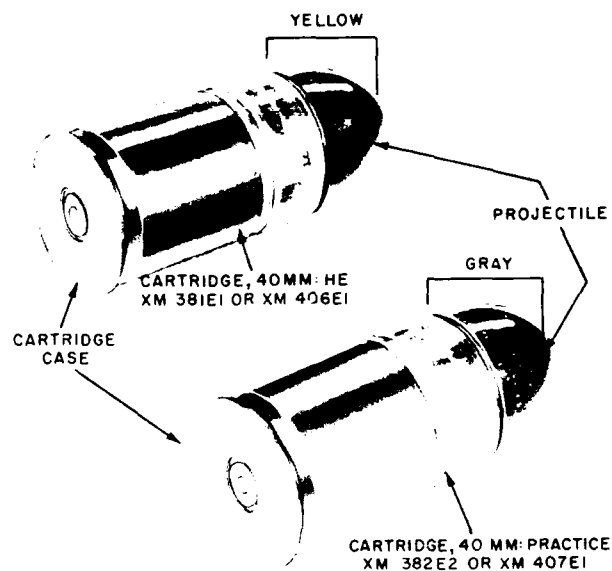
The cartridges used with the launcher, as shown in figure 5-5, are fixed-type munition that consists of two major assemblies: the cartridge case and the projectile.

Five standard *A* types of 40-mm ammunition are used with the launcher: high explosive (HE), high explosive airburst (HE air-burst), high explosive smokeless and flashless, high explosive dual purpose (HEDP), and training practice (TP).

These cartridges are ready for use as issued. No prior preparation of the rounds is required other than removal from the packing and insertion into the weapon.

SAFETY PRECAUTIONS

The safety precautions that should be observed to prevent injury to personnel using the launcher



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Figure 5-5.—Cartridges used with grenade launcher M203.

or damage to the ammunition or both are given below:

1. The cartridges should be free of sand, mud, moisture, frost, snow, ice, grease, or other foreign matter before insertion into the weapon.
2. Do not fire ammunition that is corroded.
3. Take care at all times to protect the primer and the aluminum ogive (diagonal rib on the round). They are easily dented and should be protected from hard knocks or blows. The plastic inserts used in the packing of these rounds serve this purpose.
4. Do not use cartridges which have been damaged or those having an indication of separation.
5. Do not fire ammunition unless it has been identified by its lot number and grade.
6. Misfires and hangfires must be handled as previously stated in the above sections.
7. Do not fire at targets within an 80-meter radius of friendly troops or your firing position unless there is adequate protection from fragment hazard.
8. Do not fire canopy smoke cartridges so that the falling ignited projectile could descend upon

friendly troops and cause injury to friendly personnel, damage to their material, or both.

M60 MACHINE GUN

The M60 machine gun is one of two fully automatic weapons in the SEABEE battalion. The other is the .50-caliber M2 machine gun, which will be discussed later in this chapter.

The M60 is used to support the rifle fire teams in a unit. It is capable of delivering a heavy volume of controlled and accurate fire, both in offensive and defensive situations. Its capability is more than that of other individual small arms. The M60 machine gun can effectively engage predetermined targets under all conditions of visibility. Naval Construction Battalion fire plans are made around the final protective fires of the M60 machine gun.

CHARACTERISTICS OF THE M60 MACHINE GUN

The M60 machine gun is an air-cooled, belt-fed, gas-operated automatic weapon. The weapon features fixed headspace that permits rapid changing of the barrel. (Two barrels are issued with each weapon, and an experienced gun crew can change the barrel in a few seconds.) The M60 fires from the open bolt position. Ammunition is fed into the gun by a disintegrating metallic split-link belt. The gas from the previously fired round provides energy to cock, load, and fire the next round. The bolt must be to the rear before the round can be picked up and fed into the chamber. It fires the standard 7.62-mm NATO (North Atlantic Treaty Organization) cartridge at a sustained rate of 100 rounds per minute with 6 to 8 rounds per burst for 10 minutes; then you must change the barrel. On rapid fire, it can deliver up to 200 rounds per minute for 2 minutes before the barrel must be changed. The cyclic rate of fire is 550 to 600 rounds per minute, with a barrel change required every minute. Muzzle velocity is 2700 feet per second, with a maximum range of 3725 meters. The maximum effective range is 1100 meters.

GENERAL DATA

Ammunition	7.62-mm ball, tracer, blank, and dummy
Length	43.5 inches
Weight	23.2 pounds
Weight of M122 tripod with traversing and elevating mechanism, pintle, and platform	19.5 pounds
Weight of spare barrel case, complete	13.5 pounds (rubberized case) 16.5 pounds (canvas case)
Height of gun on tripod	16.5 inches
Rates of fire:	
Sustained	100 rounds per minute
Rapid	200 rounds per minute
Cyclic	550 to 600 rounds per minute
Maximum range	3725 meters (approximate)
Maximum effective range	1100 meters
Elevation, tripod, controlled	265 mils
Depression, tripod, controlled	200 mils
Elevation, tripod, free	445 mils
Depression, tripod, free	445 mils
Traverse, tripod, traversing bar	875 mils (425 left and 450 right)
Traverse, tripod, traversing handwheel	100 mils
Traverse, free	6400 mils

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The external nomenclature of the M60 machine gun is shown in figure 5-6.

The M60 has a front sight permanently affixed to the barrel. The rear-sight leaf, as shown in figure 5-7, is mounted on a spring-type dovetail. It can be folded forward horizontally when the gun is to be moved. The range plate on the sight leaf is marked for each 100 meters, from 300 meters to

the maximum effective range of 1100 meters. Range changes may be made by using either the slide release or the elevating knob. The slide release is used for making major changes in elevation. The elevating knob is used for fine adjustments, such as those made during zeroing. Four clicks on the elevating knob equal a 1-mil change of elevation. The sight is adjustable for windage 5 mils right and left of zero. The windage

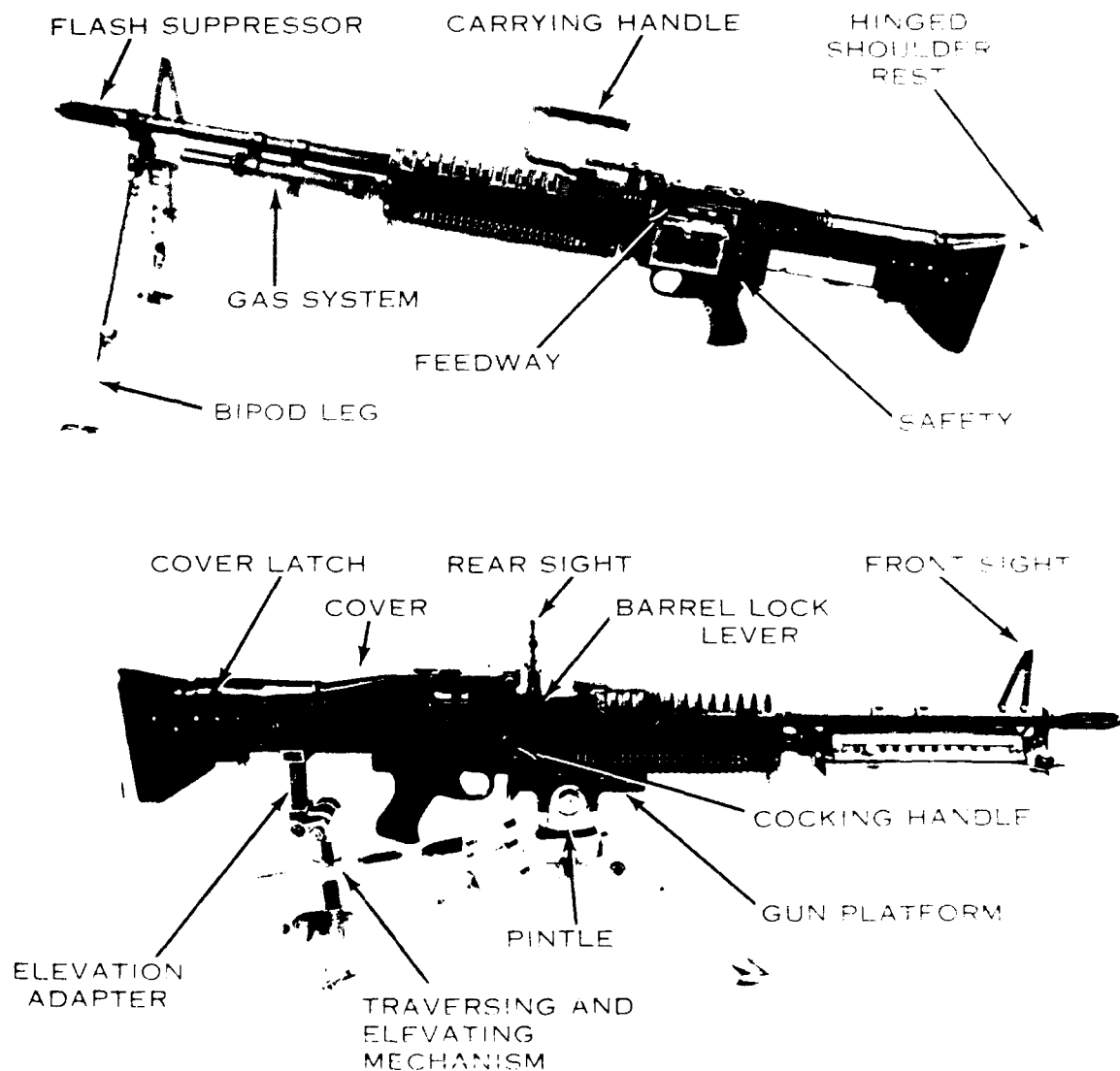


Figure 5-6.—External nomenclature of the M60 machine gun.

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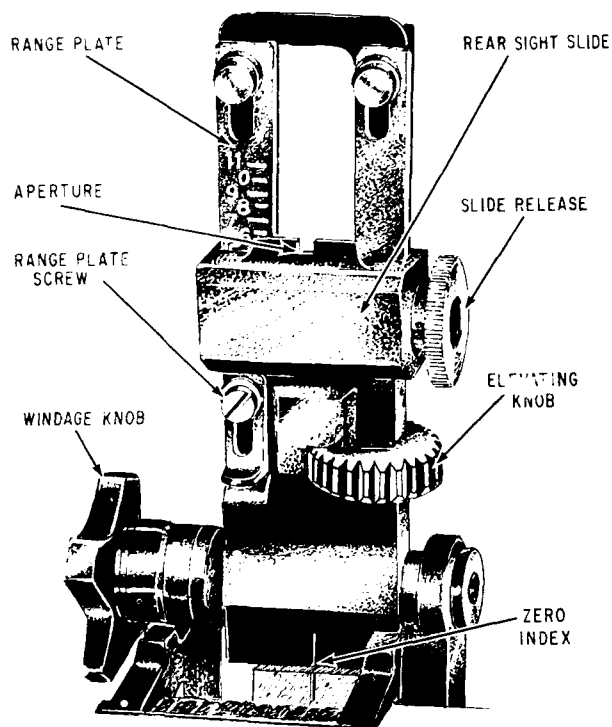


Figure 5-7.—The rear sight.

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knob is located on the left side of the sight. One click on the windage knob equals a 1-mil change of deflection.

A safety lever is located on the left side of the trigger housing. It has an S (safe) and an F (fire) position. On the S position the bolt cannot be pulled to the rear or released to go forward. The cocking handle on the right side of the gun is used to pull the bolt to the rear. Always remember that the cocking handle must be returned manually to its forward position each time the bolt is manually pulled to the rear.

The flash suppressor is affixed to the muzzle of the barrel. The ribs of this suppressor vibrate during firing and dissipate flash and smoke.

The M60 can be effectively fired from the integral bipod mount (fig. 5-6). The hinged shoulder rest provides support for the rear of the gun. The movable carrying handle provides a method for carrying the gun short distances and can be positioned out of the gunner's line of sight.

The bipod mount is an integral part of the barrel group. The bipod yoke fits around the barrel and is held in position by the flash suppressor, as shown in figure 5-8.

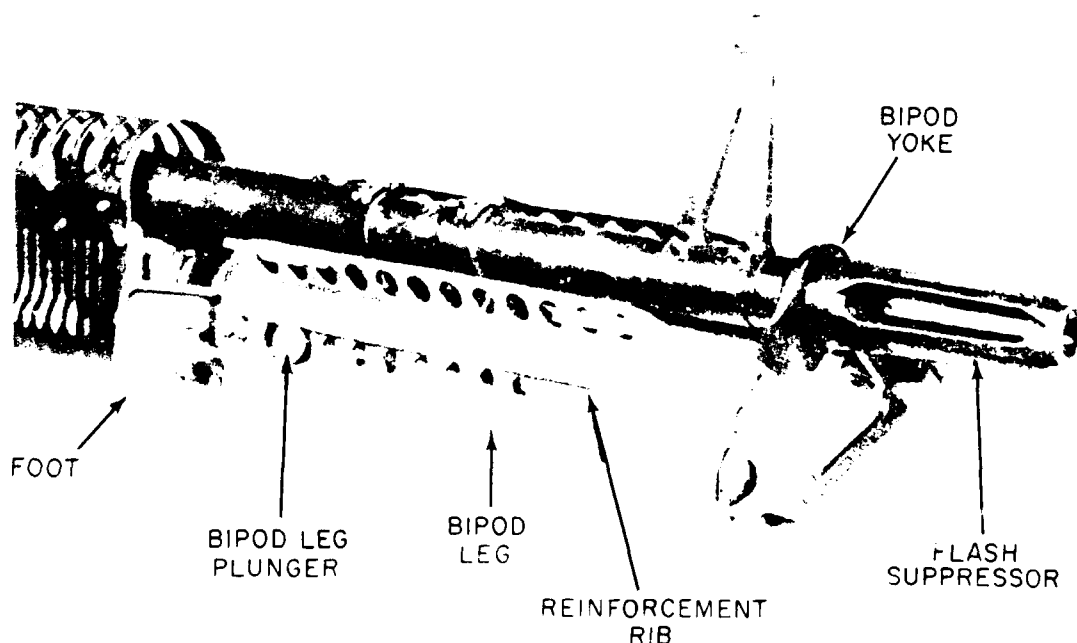


Figure 5-8.—Bipod mount.

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To lower a bipod leg, pull it to the rear (compressing the lock spring) and push it downward, as shown in figure 5-9. The leg automatically locks when in the down position.

To lengthen a bipod leg, pull down on the foot, as shown in figure 5-10. The bipod leg plunger engages a notch in the bipod leg extension and holds it in the desired position. To shorten the bipod leg, depress the bipod leg plunger and push up on the bipod foot (fig. 5-10).

The M122 tripod mount provides a stable and durable mount for the M60 machine gun. Firing the gun from the tripod permits a high degree of accuracy and control.

The M122 tripod mount consists of the tripod assembly, the traversing and elevating mechanism, and the pintle and platform.

The tripod mount consists of the tripod head with a pintle bushing and the pintle lock, one front and two rear legs, and a traversing bar as shown in figure 5-11. The traversing bar connects the two rear legs and supports the traversing and elevating mechanism. Engraved on the bar is a scale that is divided into 100-mil major divisions and 5-mil subdivisions, 450 mils to the left and 425-430 mils to the right of center. A sliding sleeve connects the traversing bar and a rear leg to permit the legs to fold. Position stops are provided to stop the traversing bar in the open or closed positions. The sleeve latch on the right rear leg secures the traversing bar when in the open position. (See fig. 5-11.)

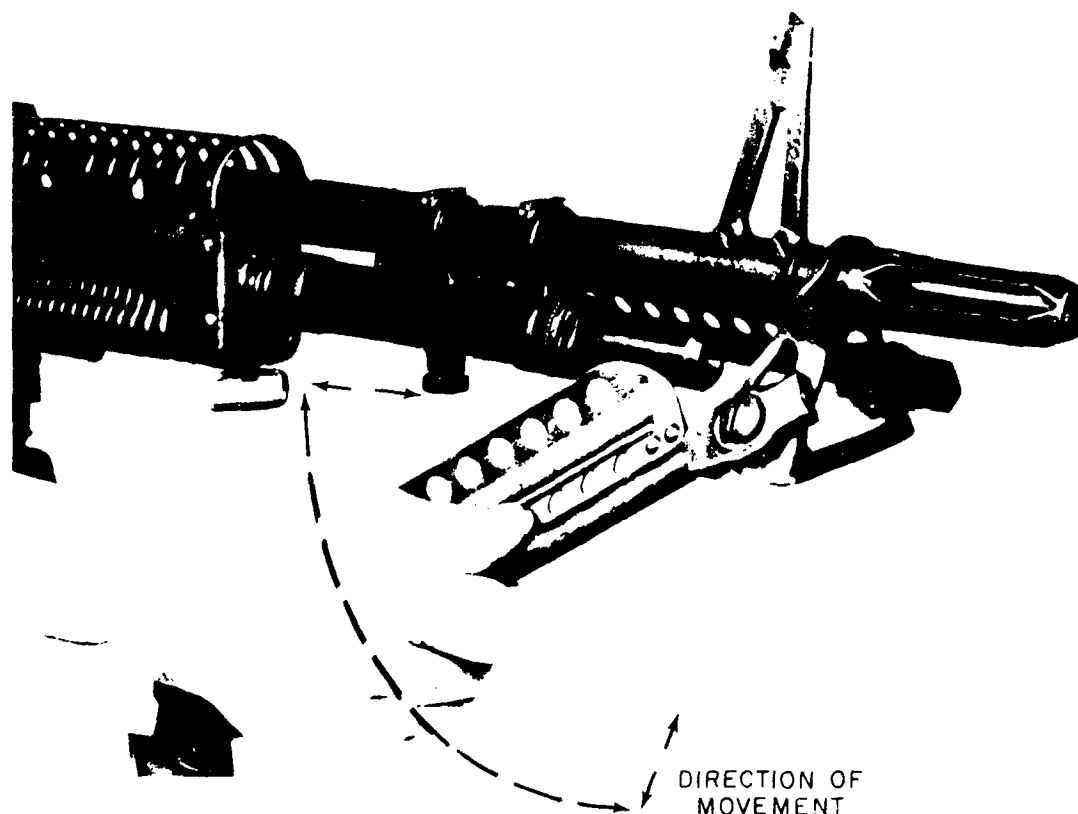


Figure 5-9.—Lowering the bipod leg.

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The traversing and elevating mechanism shown in figure 5-12 consists of (1) the elevation adapter, which connects to the mounting plate on the bottom of the receiver, and (2) the traversing handwheel, which has a mil-click device built into it. One click equals

a 1-mil change. Engraved on the traversing handwheel is a scale divided into 1-mil increments for a total of 25 mils. Use of the traversing mechanism allows the gun to be traversed approximately 100 mils (50 mils right and left of center).

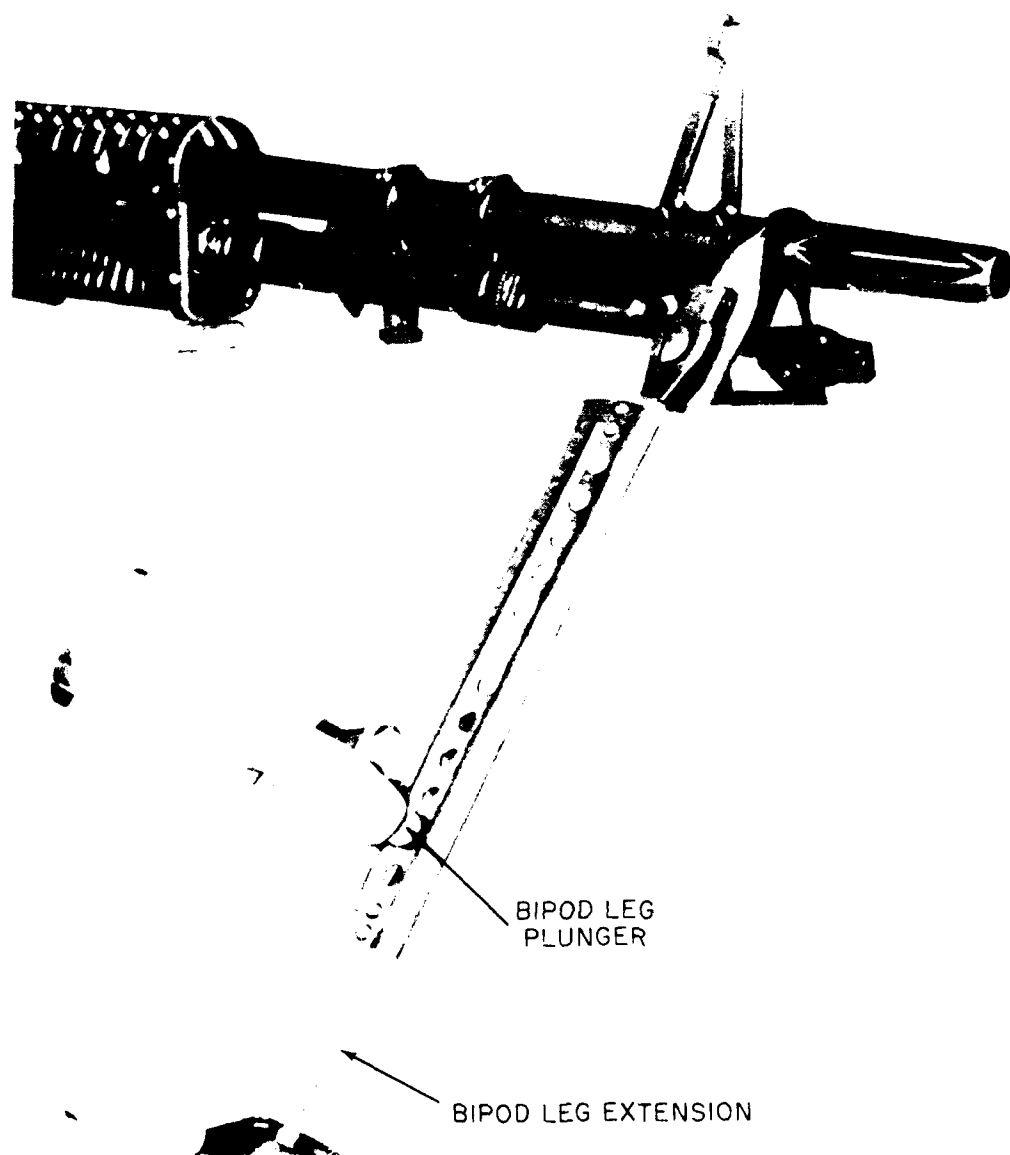
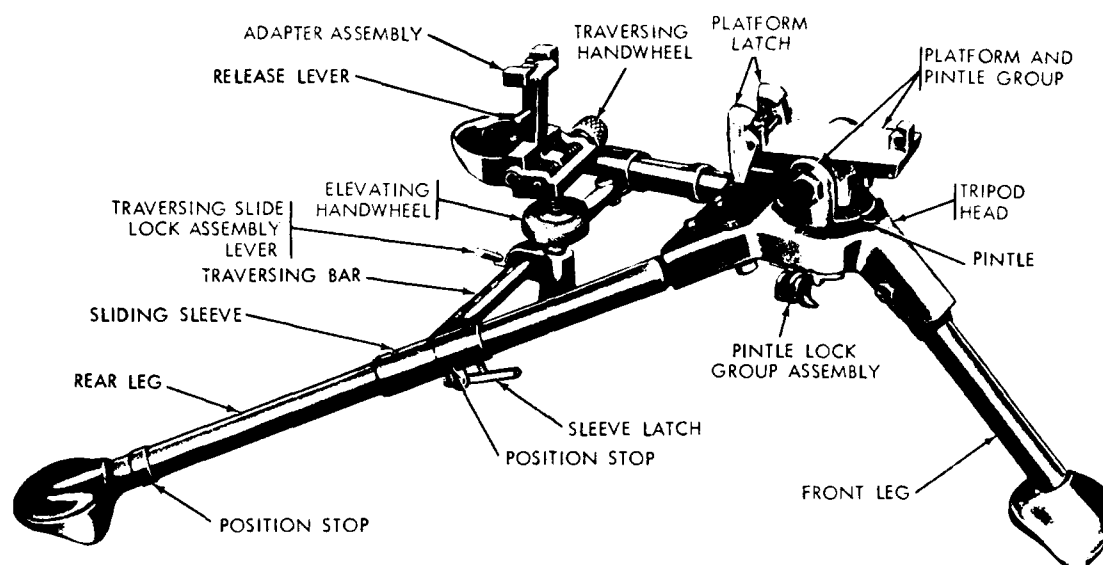


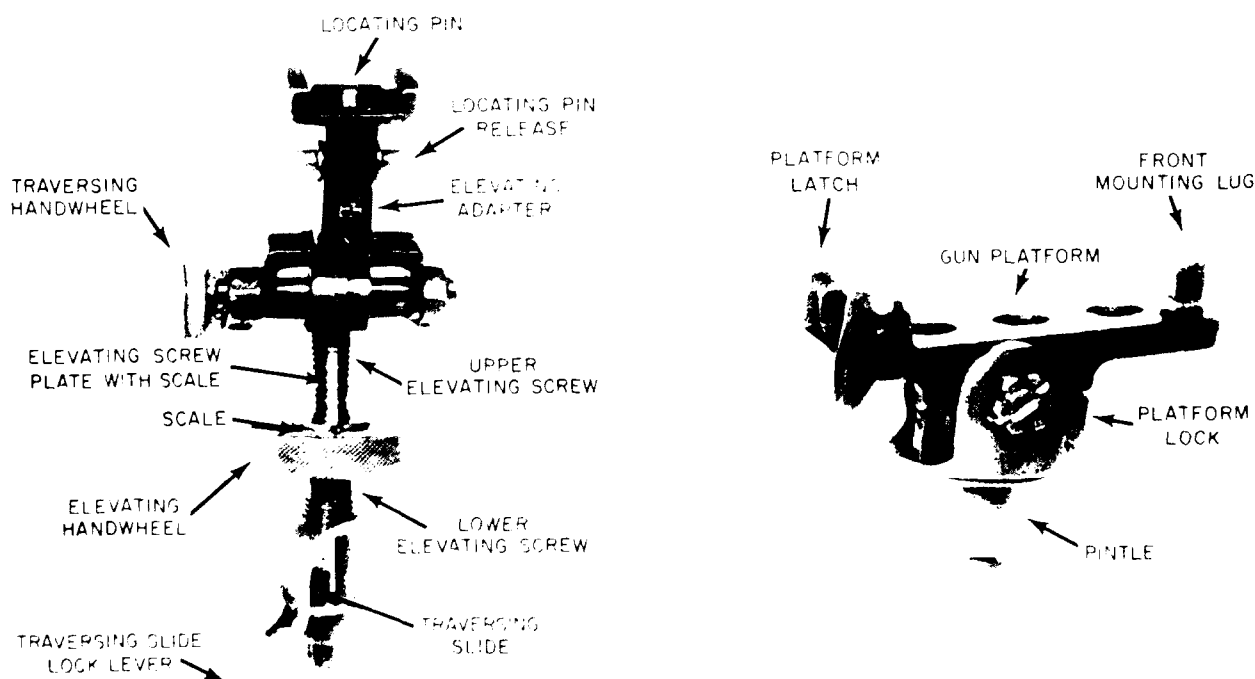
Figure 5-10.—Adjusting the bipod leg extension to lengthen the leg.

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Figure 5-11.—Machine gun tripod mount, M122.



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Figure 5-12.—Traversing and elevating mechanism, pintle, and platform group.

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The elevating handwheel has a mil-click device built into it. One click equals a 1-mil change. Engraved on the handwheel is a scale divided into 5-mil major divisions and 1-mil subdivisions. The scale is read directly from the indicator. The upper elevating screw has the elevating screw plate, which is graduated into 50-mil increments. There are 200 mils above and 200 mils below the zero mark for a total of 400 mils in elevation change.

The traversing slide lock lever allows rapid lateral adjustments along the traversing bar. Readings are taken from the left side of the slide.

The pintle and platform shown in figure 5-12 consist of the gun platform, to which the gun is attached, and the pintle, which is secured to the tripod assembly.

To mount the gun, (1) lock the pintle and platform into the pintle bushing, as shown in figure 5-13; (2) position the front locating pin (in

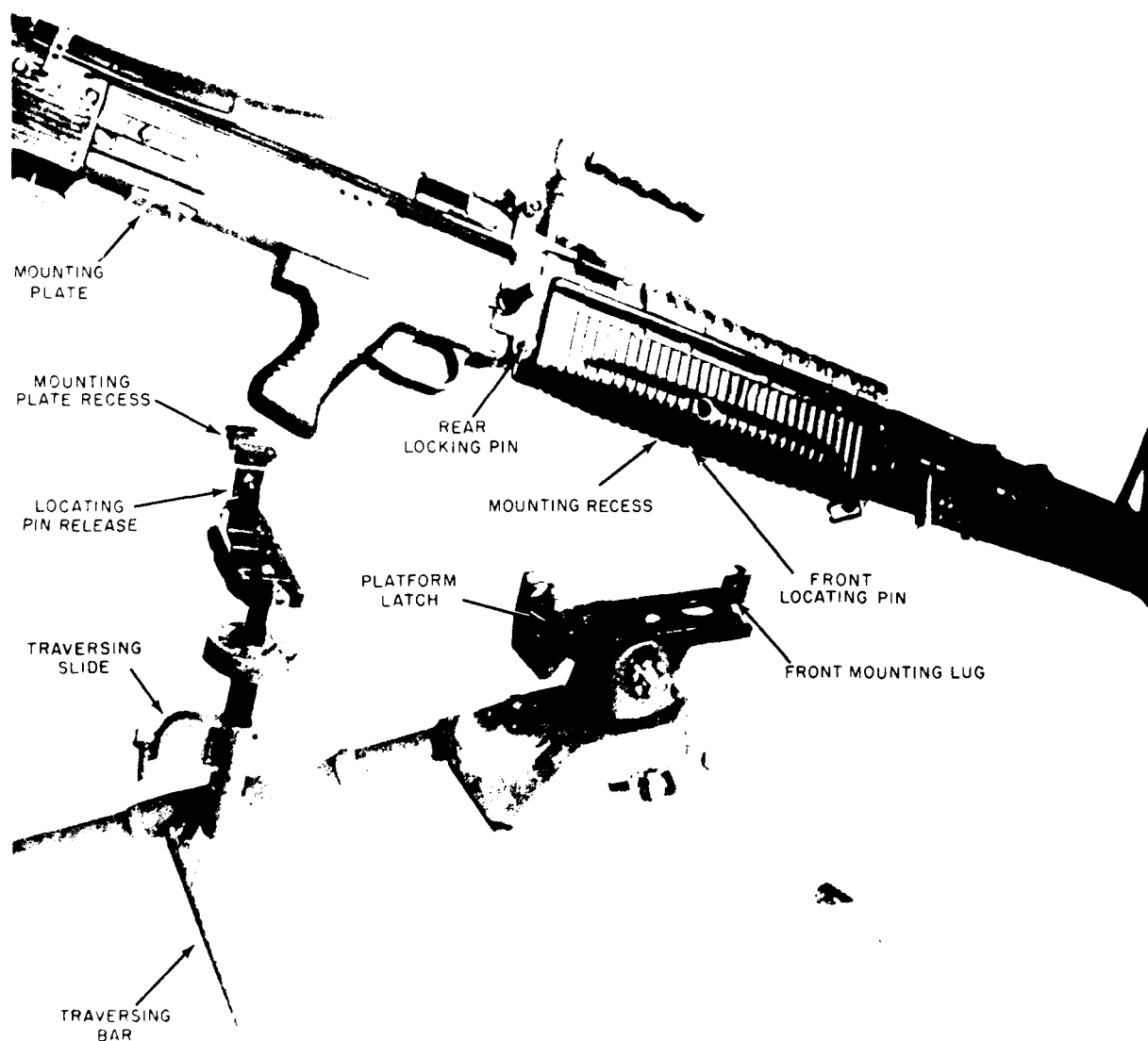


Figure 5-13.—Gun in relation to the tripod.

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the forearm assembly) in the front mounting lug; and (3) lower the receiver so that the rear locking pin snaps under the platform latch.

To attach the traversing and elevating mechanism, mount the gun on the tripod and take the following steps: (1) release the platform lock and raise the rear of the gun; (2) place the mounting plate recess on the rear of the mounting plate and push it forward, as shown in figure 5-14 (the adapter pin automatically locks into position in the bottom of the mounting plate); and (3) lower the rear of the gun, place the traversing slide (with the traversing slide lock lever to the rear) on the traversing bar, and lock into position.

To remove the traversing and elevating mechanism, release the traversing slide-lock lever and raise the rear of the gun. Pull down on the adapter pin release and pull the mechanism straight back off the mounting plate, as shown in figure 5-15.

Return the platform lock to the down position. Stand to the left of the gun and grasp the carrying handle with the left hand. With the right hand, depress the platform latch and raise the rear of the gun slightly, thus removing the rear locking pin from under the platform latch. Place the right hand on the top of the stock, pull the gun slightly

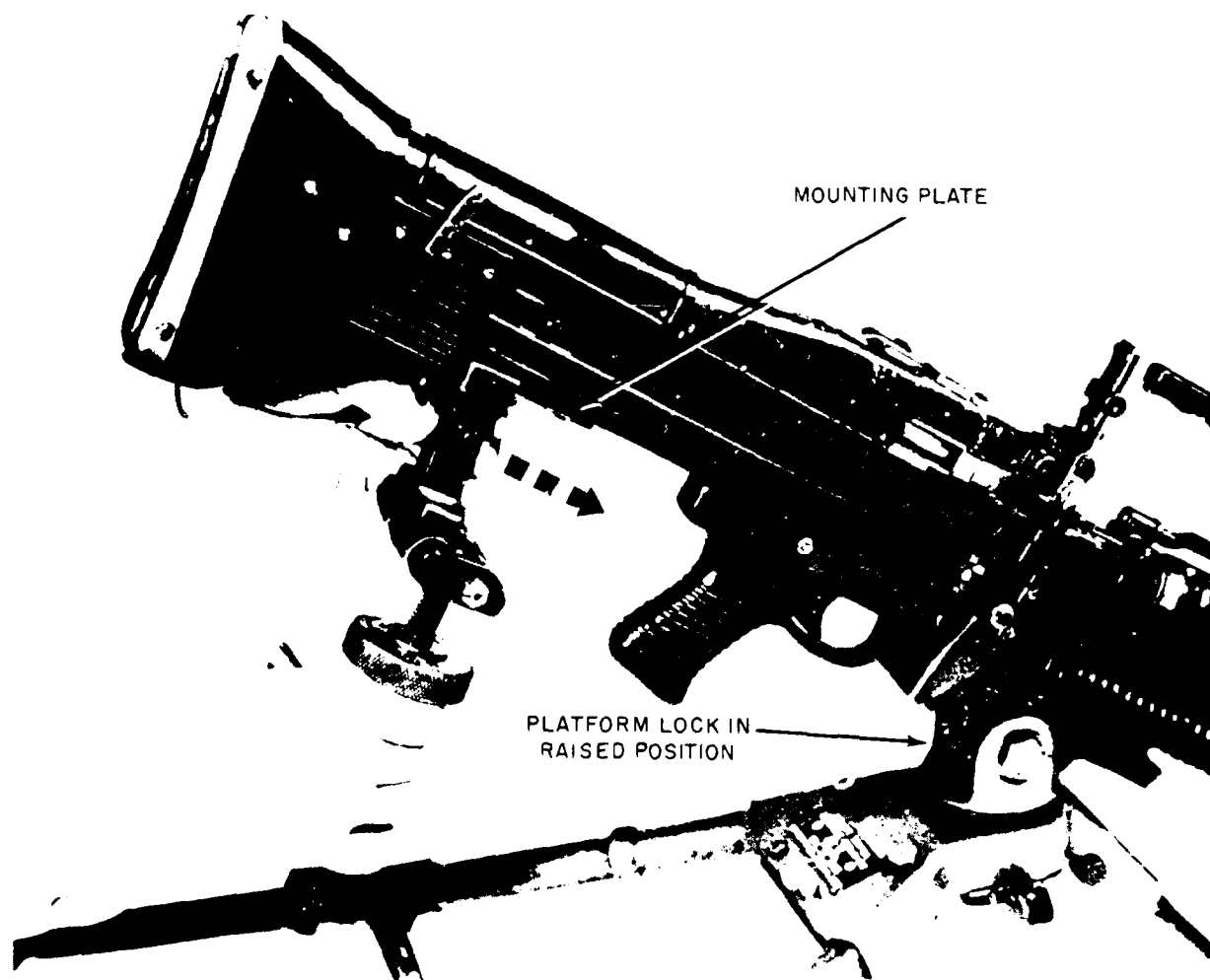


Figure 5-14.—Attaching the traversing and elevating mechanism.

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Figure 5-15.—Removing the traversing and elevating mechanism.

to the rear, push down on the stock, and lift the gun from the mount.

OPERATION

The M60 machine gun is loaded, fired, unloaded, and cleared in the OPEN-BOLT position. The safety must be placed in the F (fire) position before the bolt can be pulled to the rear.

To load the machine gun, check to make sure the safety is in the F position. Using the cocking handle, pull the bolt to the rear. When the bolt is held to the rear by the sear, return the cocking handle to the forward position and place the safety in the S (safe) position. Raise the cover to ensure that the feed tray, receiver, and the chamber are clear. Place the first round of the belt in the feed tray groove and close the cover, ensuring that the round remains in the feed tray groove.

To unload the machine gun, pull the bolt to the rear, place the safety in the S position, and return the cocking handle to the forward position. Raise the cover and remove any ammunition or links from the feed tray.

To clear the machine gun, pull the cocking handle to the rear, place the safety in the S position, and push the cocking handle forward. Then raise the cover and inspect the chamber; if it is clear, close the cover and place the safety in the F position; then pull the trigger. After the bolt has gone forward, place the safety in the S position.

FUNCTIONING

By having a basic knowledge of how the machine gun functions, you will be able to recognize and correct stoppages that occur during firing.

The machine gun is designed to function automatically as long as ammunition is fed into the chamber and the trigger is held to the rear. Each time a round is fired, the parts of the machine gun function in a certain sequence. The sequence of operation is known as the cycle of functioning.

The cycle of functioning is divided into eight basic steps, which are listed below in the order they occur; however, more than one step may occur at the same time.

FEEDING—A round is positioned into the feedtray groove.

CHAMBERING—A round is stripped from the belt and placed in the chamber.

LOCKING—The bolt is locked inside the barrel socket.

FIRING—The firing pin strikes and detonates the primer of the cartridge.

UNLOCKING—The bolt is unlocked from the barrel socket.

EXTRACTING—The empty case is pulled from the chamber.

EJECTING—The empty cartridge case is thrown from the receiver.

COCKING—The sear engages the sear notch.

MALFUNCTIONS

A malfunction is a failure of the gun to function satisfactorily. Defective ammunition or

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improper operation of the gun by either you or one of your crewmembers is not considered a malfunction of the gun. Two of the more common malfunctions of the M60 machine gun are sluggish operation and a runaway gun: Sluggish operation of the gun is usually caused by excessive dirt or carbon, lack of proper lubrication, burred parts, or excessive loss of gas. Clean and lubricate the gun; inspect for burred parts and have them replaced as necessary by the armorer. Excessive loss of gas is usually caused by a loose or missing gas-port plug.

The best method of stopping a runaway gun depends on many factors. Some of those factors are the amount of ammunition remaining in the belt, how the gun is mounted, and whether an assistant gunner is present. For example, in assault firing with the bandoleer attached to the gun, you will continue to move forward, keeping the gun on target until the ammunition is expended. In other types of firing, the primary consideration is keeping the gun on target; however, either you or the assistant gunner may be able to stop the gun by twisting or breaking the belt to stop the feeding.

When you have ceased firing the gun, field strip it and check the sear and sear notch for excessive wear. Check the gas system to ensure that the gas port plug, gas-cylinder extension, and gas-cylinder nut are tight. Clean the operating rod tube. Replace parts as necessary.

STOPPAGES

A stoppage is any interruption in the cycle of functioning caused by a faulty action of the gun or ammunition. Stoppages are classified by the relationship to the cycle of functioning. Table 5-1 shows the types of stoppages, their causes, and the corrective action to be taken.

IMMEDIATE ACTION

Immediate action is the action taken to reduce the stoppage without investigating the cause. This action must be accomplished within 10 seconds, including waiting time, when the barrel is hot enough to cause a cookoff. A cookoff is the ignition of a round caused by the heat of the chamber without the firing pin striking the primer of the cartridge. One hundred and fifty rounds

fired in a 2-minute period may heat the barrel sufficiently to cause a cookoff.

If a stoppage occurs, wait 5 seconds. (The bolt must remain forward for the first 5 seconds because of the possibility of a hangfire.)

After the 5-second wait, raise the cover and remove the ammunition belt and links from the feedtray.

Pull the cocking handle to the rear, making sure that the sear engages the sear notch in the operating rod; close the cover immediately; then return the cocking handle to its forward position.

During the retraction of the bolt, observe if the round is extracted and ejected. If the round is NOT extracted, pull the trigger, attempting to fire the round. If the round does not fire and the barrel is hot, wait at least 5 minutes with the bolt in the forward position to prevent damage or injury to personnel in the event of a cookoff. After the 5-minute wait, remove the round by using a cleaning rod inserted from the muzzle of the gun.

If the round is extracted, or when a round is removed from the chamber, inspect the gun and ammunition to determine the cause of the stoppage.

After clearing the machine gun, reload, rezero in on the target, and attempt to fire.

CLEANING AND LUBRICATING

Immediately after firing and on two consecutive days thereafter, thoroughly clean the bore, the chamber, and the parts that have become powder fouled with bore cleaner. Do not wipe dry. On the third day after firing, clean with bore cleaner and wipe dry; then lightly coat with oil.

Weekly thereafter when the gun is not being fired, clean the bore and chamber with bore cleaner, wipe dry, and then oil. The rest of the gun should be cleaned with a dry-cleaning solvent immediately after firing and weekly thereafter. Wipe dry and oil.

Do not clean the inside of the gas system unless blank ammunition has been used or unless the gun fires sluggishly after all other reasons for sluggishness have been checked.

Lubricate the gun with a general purpose lubricant when operating in an average climate. For hot, humid climates, inspect the gun more frequently for signs of rust. Keep the gun free of

Chapter 5—ORGANIC SUPPORT WEAPONS: M203, LAW, AND MACHINE GUNS

Table 5-1.—Malfunctions or Stoppages, Their Causes, and Corrective Action

Malfunction or stoppage	Probable cause	Corrective action	Malfunction or stoppage	Probable cause	Corrective action
Failure to feed.	Gas pressure insufficient	Clean gas port.	Failure to extract.	Ammunition faulty	Replace ammunition.
	Feed pawl or feed pawl spring defective	Return to Armorer.		Chamber dirty	Clean or change barrel.
	Front and rear cartridge guides defective	Return to Armorer.		Operating rod drive spring weakened or damaged	Armorer replaces spring.
	Cover latch defective	Return to Armorer.		Extractor or spring broken	Armorer replaces spring.
	Feed lever cam spring defective	Return to Armorer.		Short recoil	Clean gas port, operating rod tube, and lubricate.
	Cam roller defective	Return to Armorer.		Gas piston installed backwards	Install properly.
	Lubrication inadequate	Apply lubricant.		Short recoil	Clean gas port.
	Ammunition or link defective	Insert new ammunition or link.		Ejector or ejector spring frozen or damaged	Clean or armorer replaces port.
	Ammunition belt installed wrong. . .	Reverse belt with open portion of link down.		Sear broken	Return to armorer.
	Operating rod spring damaged or weakened	Armorer replaces spring.		Operating rod sear notch worn	Return to armorer.
Failure to chamber.	Obstruction in receiver	Remove obstruction.	Failure to cock.	Sear plunger or spring broken or defective. . .	Return to armorer.
	Ruptured cartridge case	Remove cartridge case.		Obstruction in receiver	Clear as required.
	Caked carbon in gas cylinder	Remove carbon.		Short recoil Sear broken or worn	Clean gas port.
Failure to fire.	Caked carbon in receiver	Remove carbon.	Runaway gun.	Sear notch on operating rod worn	Return to armorer.
	Round damaged	Remove round.		Excessive friction	Clean and lubricate.
	Firing pin damaged or broken	Armorer replaces firing pin.	Sluggish operation.	Excessive loss of gas	Tighten or replace gas port plug.
	Firing pin spring damaged or broken	Armorer replaces spring.			

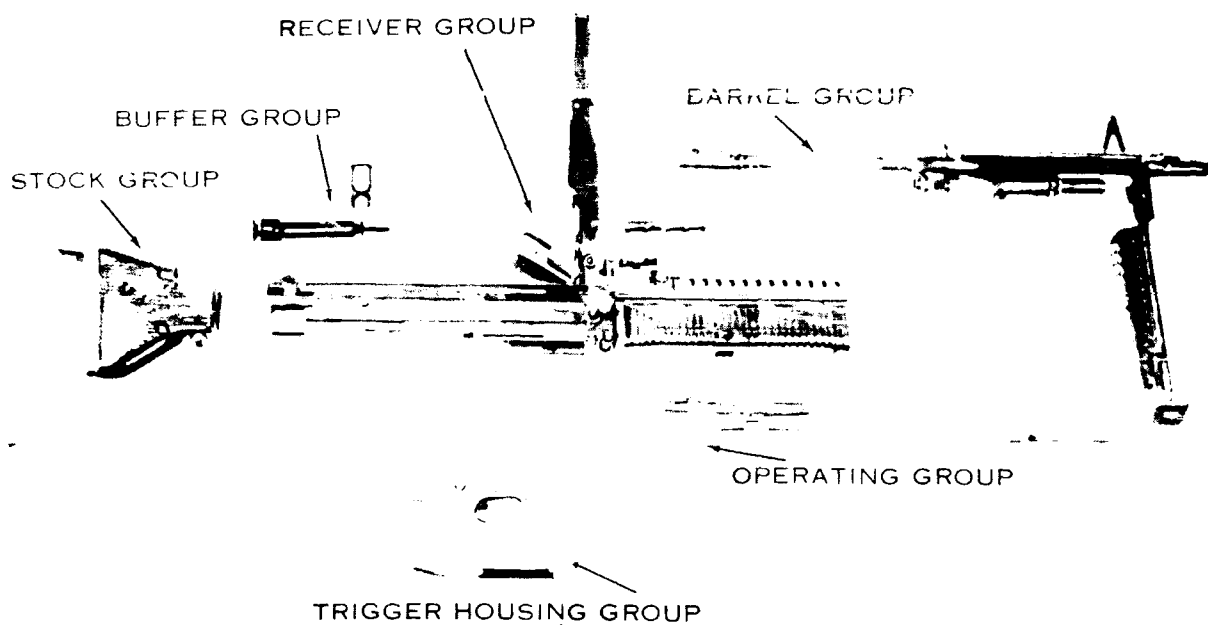


Figure 5-16.—M60 machine gun disassembled into six major groups.

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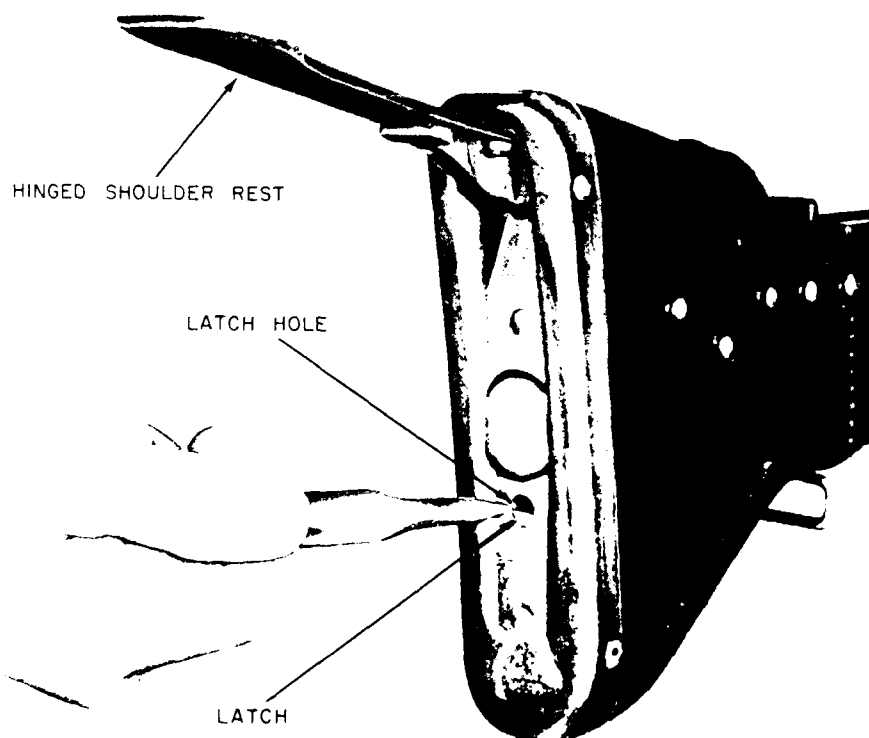


Figure 5-17.—Releasing the stock latch.

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moisture and lightly oiled with a special general purpose lubricant. If exposed to salt air, high humidity, or water, clean and oil more frequently to remove contaminated lubricants.

ACTION BEFORE AND DURING FIRING

Before firing, wipe the bore dry, inspect the weapon, and ensure the gun is properly lubricated.

During firing, change the barrels as prescribed for the number of rounds fired in a given period of time, periodically inspecting the gun to ensure it is properly lubricated; then follow the procedures given when malfunctions or stoppages occur.

FIELD STRIPPING

The M60 machine gun can be disassembled and assembled without the use of force. With exception of the barrel group, all disassembly can be accomplished with a cartridge or some other pointed object.

As you disassemble the gun, be sure to place the parts in the order in which they were removed on a clean, flat surface such as a table or

workbench. This reduces your chance of losing parts and aids you in assembling the gun.

A general disassembly (field stripping), as shown in figure 5-16, and reassembly involve the removal and replacement of the six major groups. These groups consist of the STOCK GROUP, BUFFER GROUP, OPERATING GROUP, TRIGGER HOUSING GROUP, BARREL GROUP, and the RECEIVER GROUP.

General disassembly begins with the bolt forward, the cover closed, and the safety in the S position. Before the weapon is disassembled, be sure that it has been cleared as outlined in previous sections in this chapter.

Removing the Stock Group

Raise the hinged shoulder rest and insert the nose of a cartridge into the latch hole, as shown in figure 5-17. With the latch depressed, remove the stock by pulling it directly to the rear.

Removing the Buffer Group

The buffer group consists of the buffer yoke and the buffer, as shown in figure 5-18. Hold the

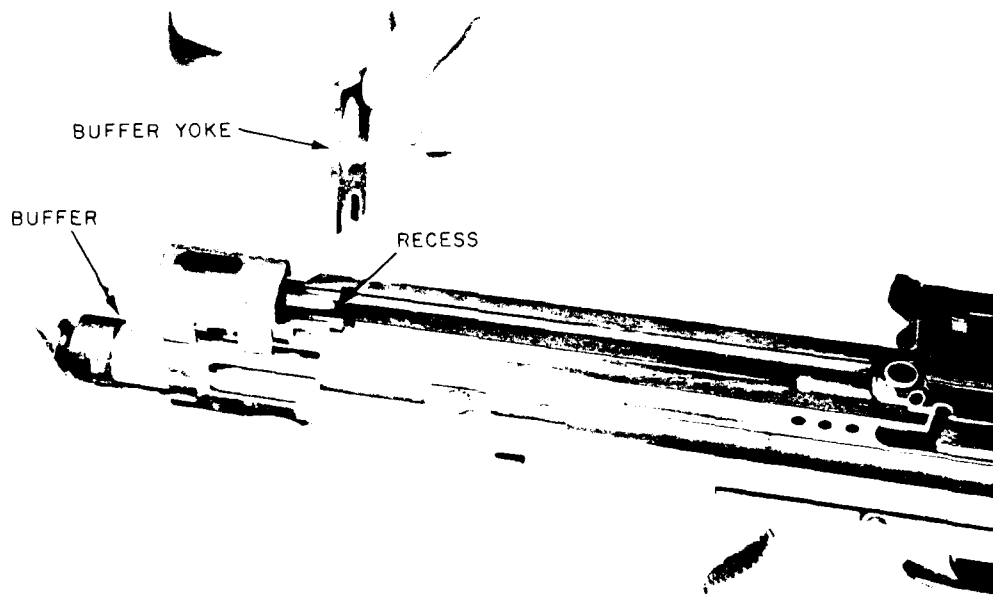


Figure 5-18.—Removing the buffer group.

palm of the hand against the exposed buffer and press lightly, as shown in the figure. Remove the buffer yoke from the top of the receiver and withdraw the buffer slowly. Allow the drive spring to expand until the end of the drive spring is exposed at the rear of the receiver, as shown in figure 5-19. Pull the buffer plunger from the drive spring guide.

Removing the Operating Group

The operating group consists of the operating rod, bolt, drive spring, and drive spring guide. Pull the drive spring guide and spring from the receiver and separate them. With the left hand, grasp the pistol grip and pull the cocking handle to the rear until the bolt is separated from the barrel socket. Continue to pull the operating rod and bolt

to the rear by pulling on the cam roller, as shown in figure 5-20.

When the operating rod and bolt are exposed approximately 4 inches to the rear of the receiver, grasp them securely to prevent the bolt from rotating and remove them from the receiver, as shown in figure 5-21. Relax the grip and allow the bolt to rotate slowly. Do not separate the bolt from the operating rod.

Removing the Trigger Housing Group

The trigger housing group consists of the trigger housing assembly (trigger housing, sear, sear plunger, sear plunger spring, trigger pin, and trigger), trigger housing pin, and the leaf spring.

Press in on the rear of the leaf spring and rotate the rear end up to clear it from the trigger

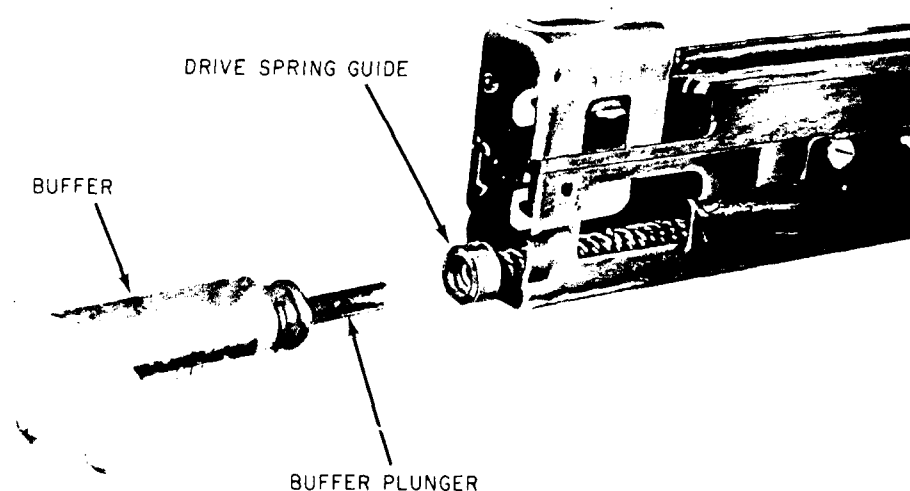
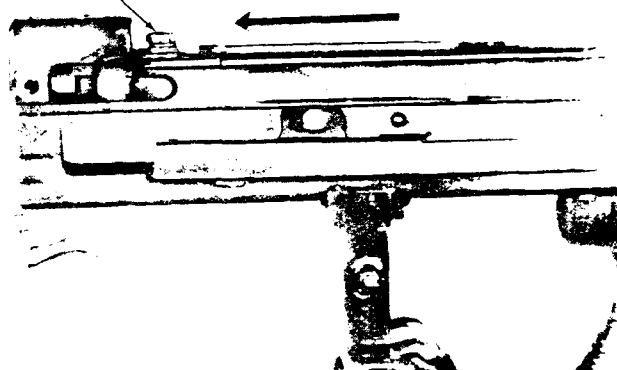


Figure 5-19.—Separating the buffer group (buffer plunger) from the operating group (drive spring guide).

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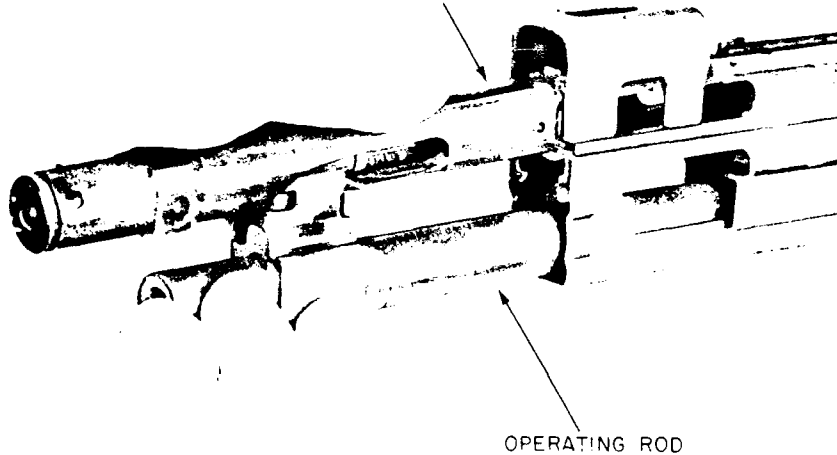
ACTUATING CAM
ROLLER



220.64

Figure 5-20.—Pull the operating rod and bolt to the rear by pulling on the cam roller.

BOLT



220.64

Figure 5-21.—Withdrawing the operating group from the receiver.

housing pin, as shown in figure 5-22. Pull forward to disengage the rear notch from the sear pin. Remove the trigger housing pin by pushing it to the left.

Slide the trigger housing group slightly forward, rotate the front of the housing down, and remove it, as shown in figure 5-23.

Removing the Barrel Group

The barrel group consists of the barrel, flash suppressor, front sight bipod assembly, and gas cylinder. Raise the barrel lock lever to the vertical position and remove the barrel group by pulling it to the front, as shown in figure 5-24.

Removing the Receiver Group

The receiver group consists of the receiver, forearm assembly, rear sight, cover, feed tray, and carrying handle. General disassembly is completed after the removal of the other five groups from the receiver group.

Replacing the Barrel Group

Ensure the barrel-lock lever is in the vertical position (fig. 5-24). Insert the rear of the barrel under the barrel cover and align the gas cylinder nut with its recess in the forearm assembly. Lower the barrel-lock lever.

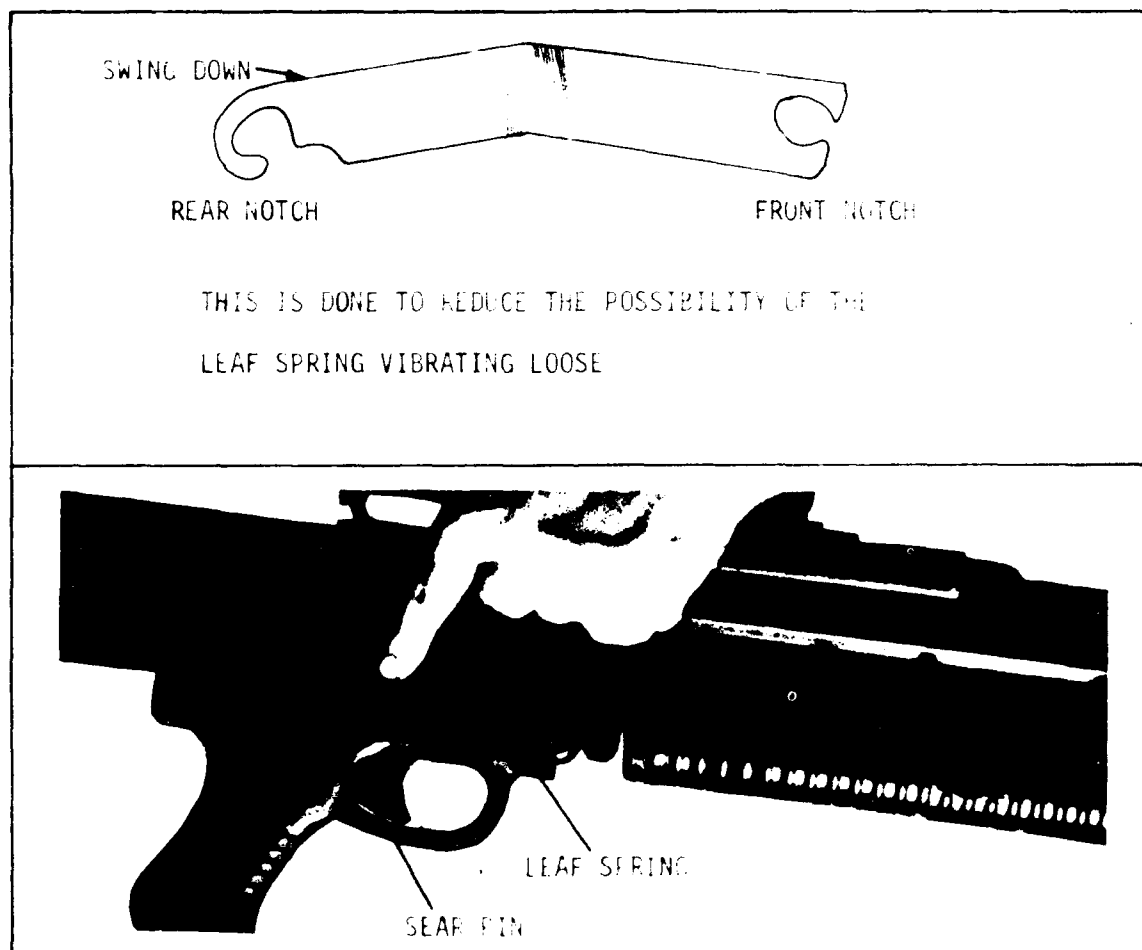


Figure 5-22.—Removing the leaf spring.

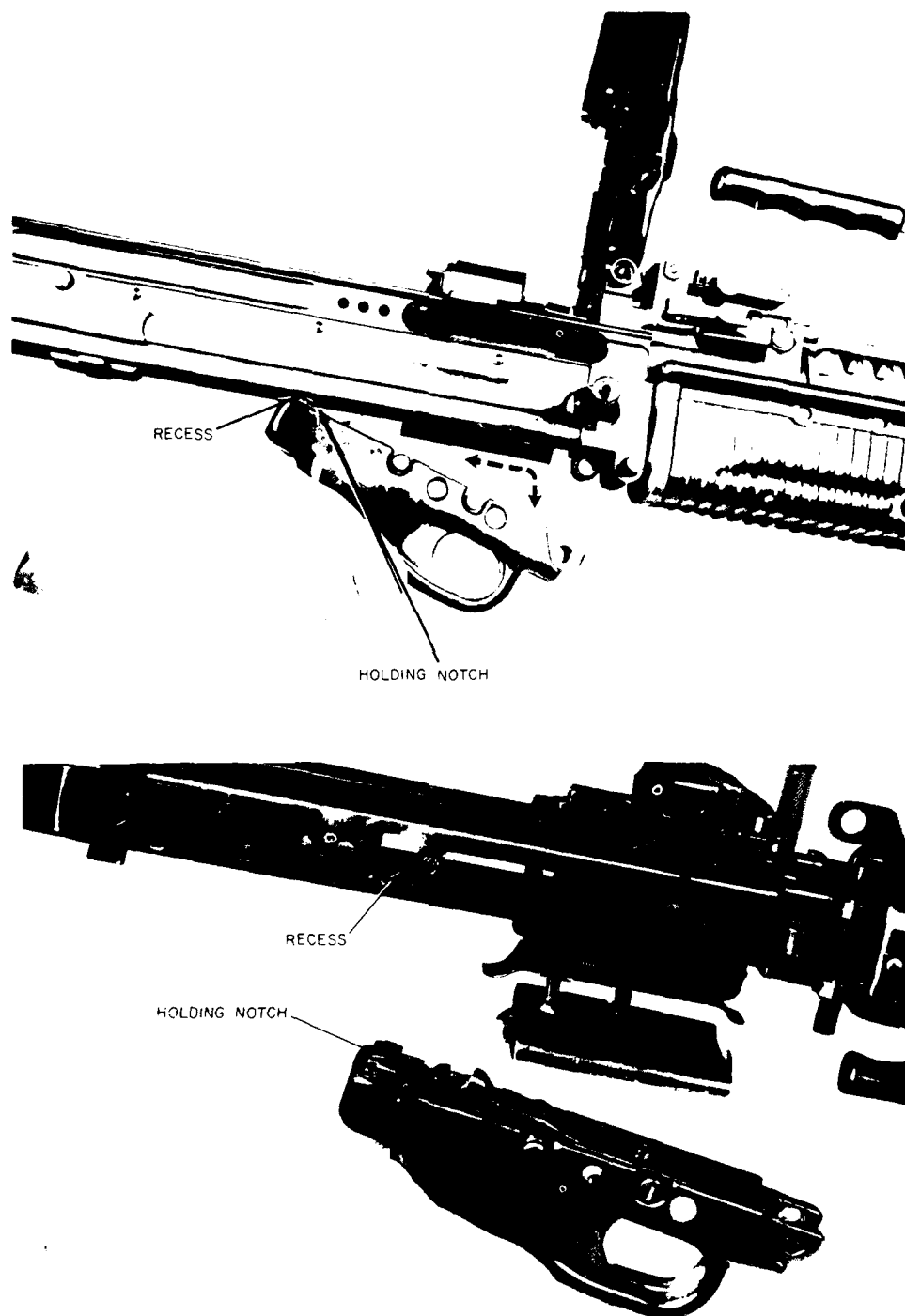


Figure 5-23.—Removing the trigger housing group.

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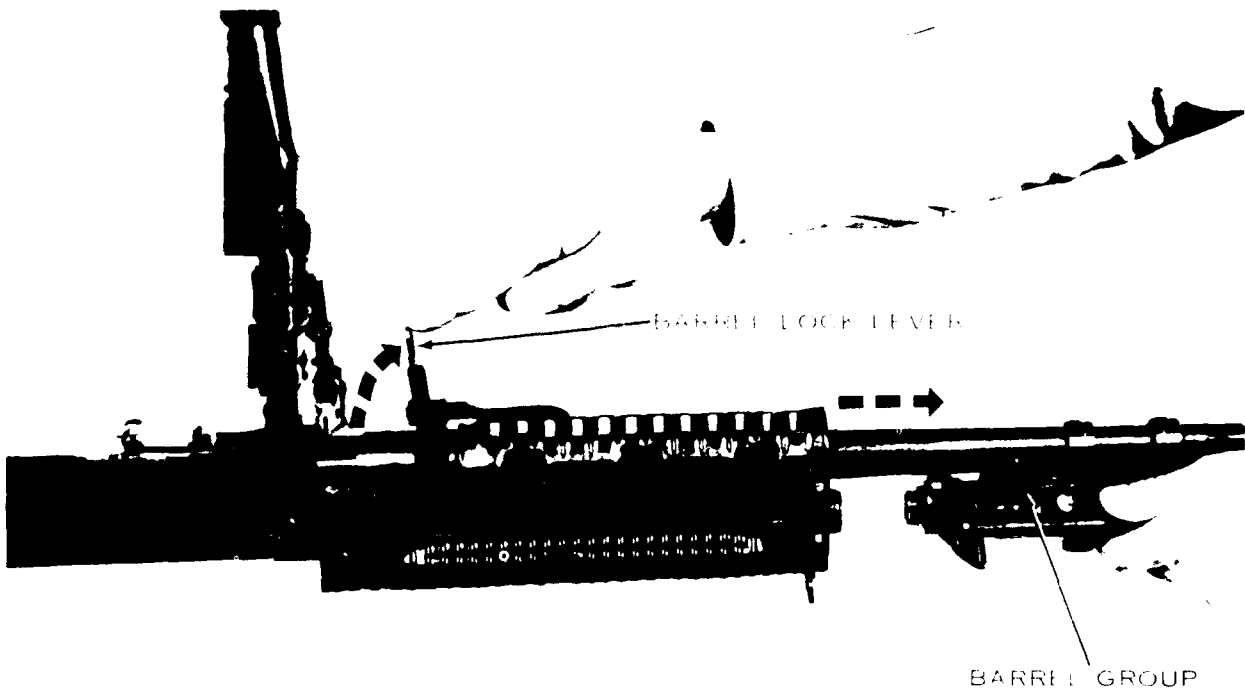


Figure 5-24.—Removing the barrel group.

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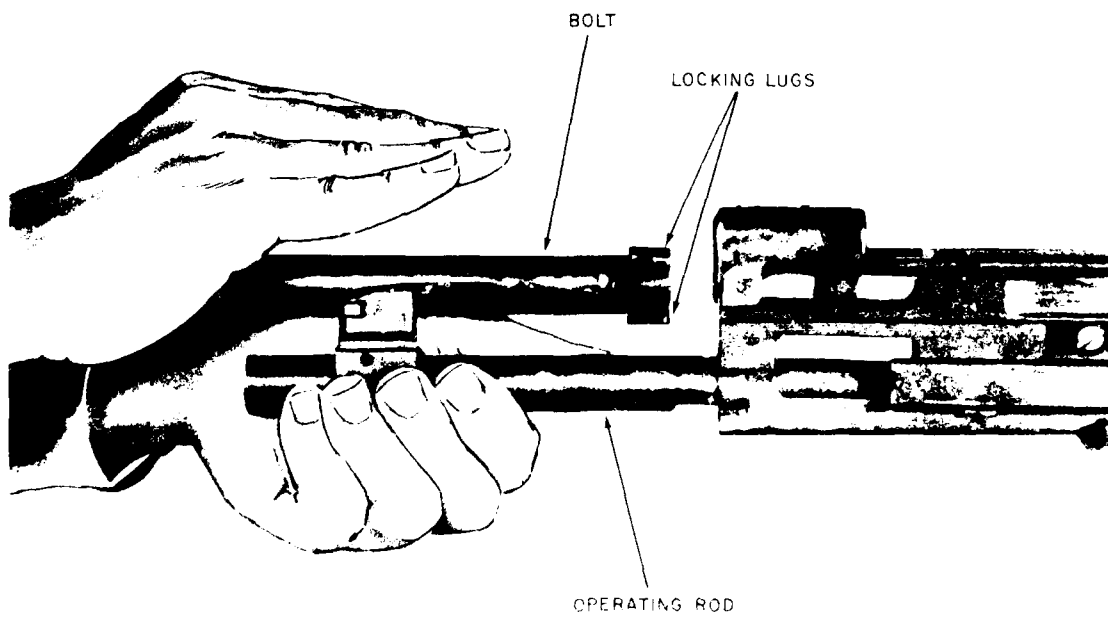


Figure 5-25.—Inserting the operating group in the receiver.

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Replacing the Trigger Housing Group

Engage the holding notch of the trigger housing in its recess in the bottom of the receiver (fig. 5-23). Rotate the front of the trigger housing up and align the holes of the trigger housing with the mounting bracket on the receiver. Insert the trigger housing pin from the left.

Engage the rear leaf spring with the sear pin (fig. 5-22). Ensure the leaf spring is positioned so that the bent portion is pressed against the side of the trigger housing. Rotate the front of the spring up and engage it with the trigger housing pin.

Replacing the Operating Group

Insert the end of the operating rod into the receiver. Hold the rod with one hand. With the other hand, push forward on the rear of the bolt, causing the bolt to rotate until the locking lugs are in a vertical position, as shown in figure 5-25.

With the cam roller up, push the operating rod and the bolt into the receiver until the end of the operating rod is even with the rear of the receiver, as shown in figure 5-26.

Insert the drive spring guide into the drive spring; then insert the opposite end of the drive spring into the recess of the operating rod (fig. 5-26). Pull the trigger and push in the drive spring until the head of the guide is approximately an inch from the receiver (fig. 5-19).

Replacing the Buffer Group

Insert the buffer plunger into the drive spring guide (fig. 5-19). Push forward on the buffer until the operating rod and bolt go forward fully.

Push in on the buffer until the recesses on the buffer are aligned with the recesses in the receiver. Replace the buffer yoke from the top of the receiver (fig. 5-18).

Replacing the Stock Group

Align the guide rails of the stock with the guide rails on the receiver. Push forward until the stock is fully seated. You will hear a distinct click when the latch engages.

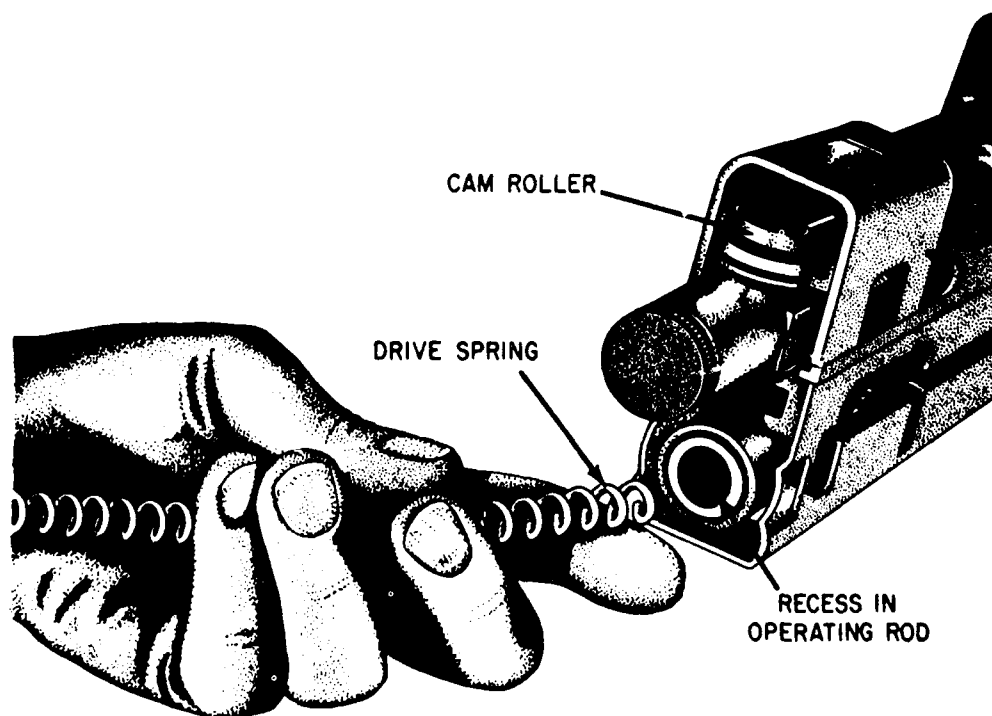


Figure 5-26.—Inserting the drive spring.

Check for Correct Assembly

To check for correct assembly, pull the cocking handle to the rear and return it to its forward position. Close the cover and pull the trigger. The bolt should go forward.

AMMUNITION

As a member of the M60 machine gun crew, you must be able to recognize the types of

ammunition available and know how to care for the different types.

Based upon the type of projectile, the ammunition authorized for the M60 machine gun is classified as follows:

1. Ball cartridges are used against light material targets, such as houses and personnel, and during training.

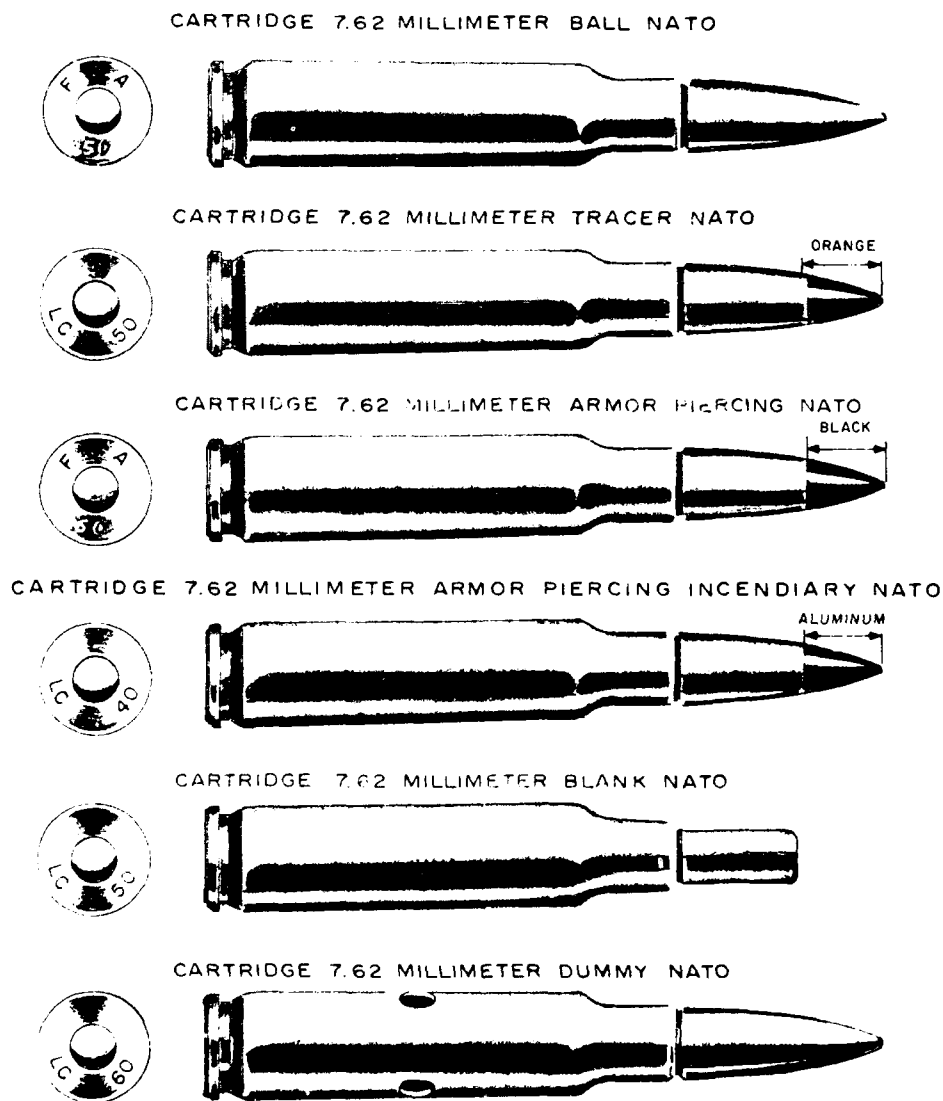


Figure 5-27.—NATO 7.62-mm cartridges for the M60 machine gun.

2. Armor-piercing cartridges are used against lightly armored targets where armor-piercing effects are desired.

NOTE: This type cartridge is NOT authorized for training purposes.

3. Armor-piercing incendiary cartridges are used for desired armor-piercing effects combined with fire producing (incendiary) effects.

NOTE: This type of cartridge is NOT authorized for training purposes.

4. Tracer cartridges are used for observation of fire, incendiary effects, signaling, and during training.

5. Dummy cartridges are used during training.

6. Blank cartridges are used during training when simulated live fire is desired.

The different types of 7.62-mm NATO cartridges can be easily identified by the color of the projectile tips, the manufacturer's initials, and the year of manufacture stamped on the base of the cartridge case, as shown in figure 5-27.

Machine gun ammunition is generally safe to handle. However, you must protect the ammunition you are using from mud, sand, dirt, and water. Heavily corroded cartridges, or cartridges which have dented cases or loose projectiles, should not be fired.

Do not expose ammunition to the direct rays of the sun. If the powder becomes hot, excessive pressure may be developed when the gun is fired.

Do not oil or grease ammunition. If it is oiled, dust and other abrasives will collect on it and damage the operating parts of the gun.

FIRING TECHNIQUES FOR THE M60 MACHINE GUN

To become an effective machine gunner, you must apply and master the following four fundamental points of good marksmanship applicable to machine guns.

1. Obtaining an accurate initial burst of fire
2. Learning to adjust your fire
3. Developing mechanical skill in manipulating the controls
4. Developing speed

ACCURATE INITIAL BURST

Obtaining an accurate initial burst of fire is essential. If you can hit the enemy first, he is not going to be able to effectively return your fire. To do this, you must be able to estimate the range to the target correctly; you must correctly set your sights, and you must be able to lay the gun properly by manipulating the traversing and elevating mechanism (T & E). After the estimated range has been set on the rear sight, the gun is adjusted until the line of sight intersects the target at its center base.

Position and Grip

Except for the assault positions, the machine gunner should fire the M60 machine gun from the prone position, using either the bipod or the tripod. In permanent defensive positions, machine gun emplacements may be dug deep enough that the gunner may stand while firing.

BIPOD-MOUNTED GUN.—When firing the M60 from the bipod (fig. 5-28), you must assume a prone position to the rear of the gun. Place your

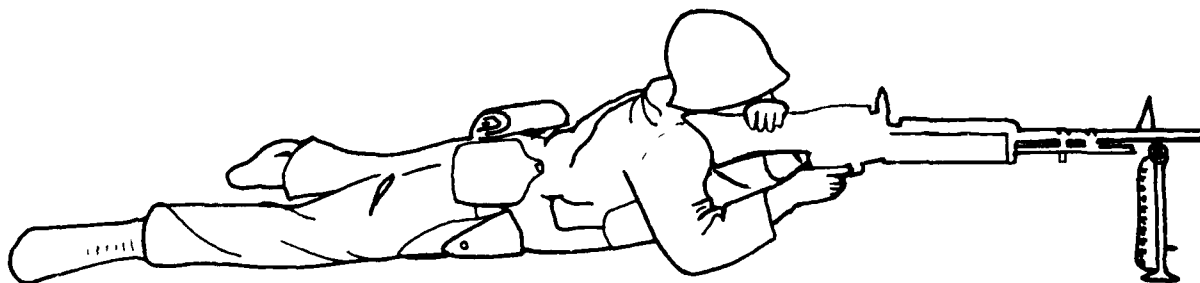


Figure 5-28.—Prone position with bipod-mounted gun.

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SEABEE COMBAT HANDBOOK

right shoulder firmly against the butt stock group and under the raised shoulder rest. An imaginary straight line extending through the barrel and receiver should pass through your right shoulder and hip (fig. 5-29). Your legs should be spread

comfortably apart, with the heels down (if possible). Grasp the handgrip with your right hand and place your index finger on the trigger. Place your left hand palm down over the rear of the feedcover and apply a downward pressure.

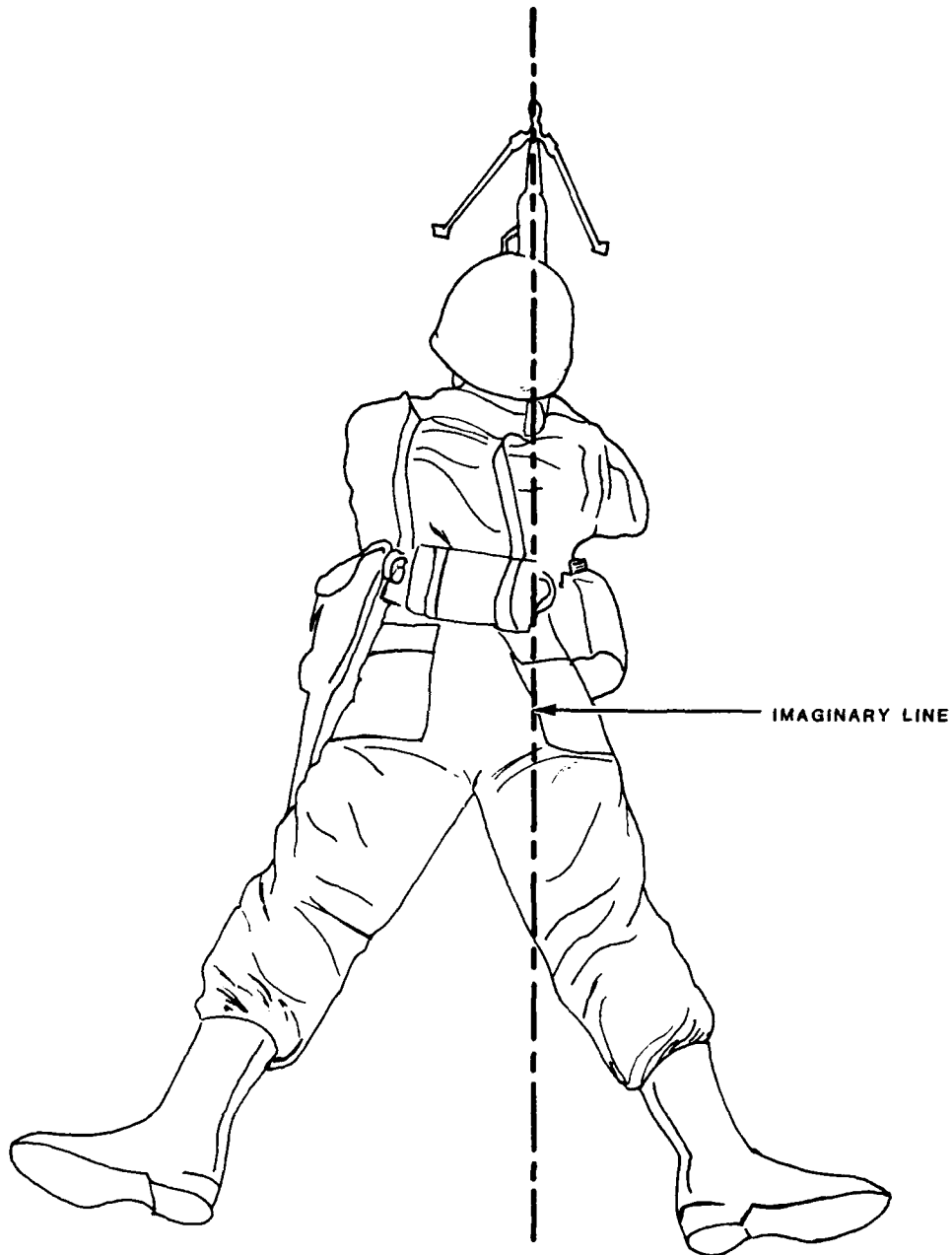


Figure 5-29.—Imaginary line.

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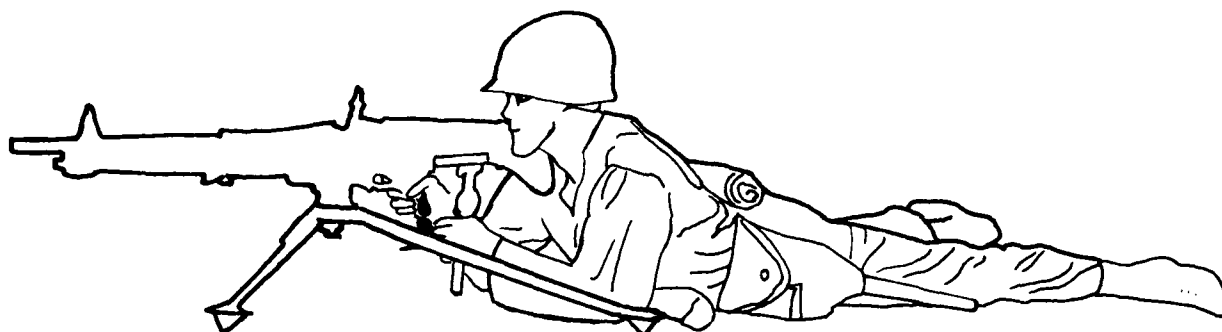


Figure 5-30.—Prone position with tripod-mounted gun.

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Rest your cheek against your hand and the feedcover. While aiming and firing, exert a firm pressure to the rear with both hands.

TRIPOD-MOUNTED GUN.—The firing position when you are firing from the tripod mount (fig. 5-30) is similar to the position used when you are firing from the bipod. The difference is that the hinged shoulder rest is not used, and your elbows should be inside the tripod legs but not touching the tripod. Your left hand grasps the elevating handwheel palm down and is used to accomplish all manipulation. When firing and aiming, exert firm pressure to the rear with both hands as you would when firing from the bipod.

Sighting and Aiming

After the proper range (elevation) and windage (deflection) have been set on the sights, they must

be properly aligned with the target. This is done by manipulating the T & E mechanism.

SIGHT ALIGNMENT.—To correctly align the sights of the M60 machine gun, center the front sight blade vertically in the aperture of the rear sight slide. The top of the front sight blade should be even with the top of the rear sight slide (fig. 5-31).

SIGHT PICTURE.—With the sight properly aligned, obtain a 6-o'clock sight picture on the target (fig. 5-32). Always aim at the center base of the target for your initial burst of fire. When shooting at enemy personnel, aim at their beltlines.

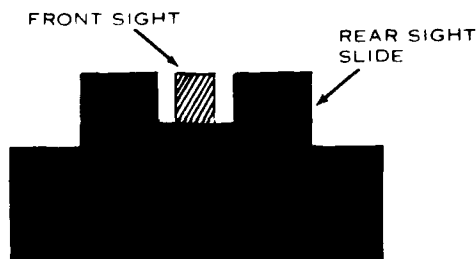


Figure 5-31.—Sight alignment.

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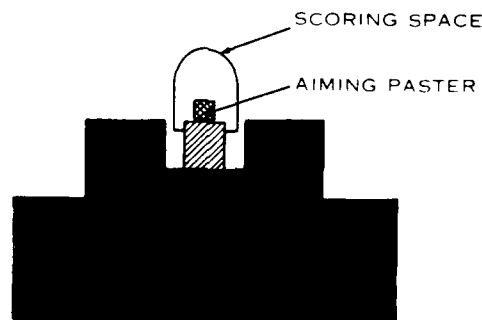


Figure 5-32.—Correct sight alignment and correct sight pictures.

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ADJUSTMENT OF FIRE

Adjustment of fire is the second fundamental point of good marksmanship. Both the team leader and the gunner must observe the strike of the bullets from the initial burst. They must be able to evaluate and adjust their fire rapidly if they are not on target.

When firing the bipod-mounted gun, you adjust fire by changing your body's position. When firing the tripod-mounted gun, you adjust fire by manipulating the tripod traversing and elevating handwheel.

ZEROING-IN

Zeroing-in the M60 is similar to zeroing-in the service rifle. Three rounds are fired at a target with a predetermined range, generally of 500 meters. The rear sight is set to 0 windage and to the corresponding range (500 meters). After the three rounds are fired, the center of the group is estimated. Next, adjust the windage knob on the rear sight, as required, bringing the strike of the bullet to the vertical center of the bull's-eye. One click clockwise or counterclockwise of the windage knob is a 1-mil adjustment. This means that at 500 meters 1 click will move the strike of the bullet 18 inches either right or left. Next, you would

change the elevation, if required, by turning the elevation knob. A 1-click adjustment clockwise or counterclockwise of the elevation knob equals a 1/4-mil change. At 500 meters this would be 4 1/2 inches (explained further in the section entitled Machine Gun Fire).

With the correct adjustments made to the rear sight, the T & E mechanism is manipulated until the correct sight picture is again obtained. You then fire one round to confirm your sight setting. If the round misses your point of aim, you must repeat the above procedure, making the necessary adjustments, until the bullet strikes where you are aiming.

After the final adjustments are made, you must put the strike of the bullet at the aiming point and adjust the rear sight range plate. To do this, loosen the screw and move the plate until the 500-meter range mark coincides with the top left edge of the rear sight slide. Tighten the range plate screw and then record the amount of deflection for future reference.

THE .50-CALIBER BROWNING MACHINE GUN

Browning machine guns (BMGs) are standard weapons used throughout the Navy. The .50-caliber BMG issued to naval activities is designated the M2. The weapon is available with

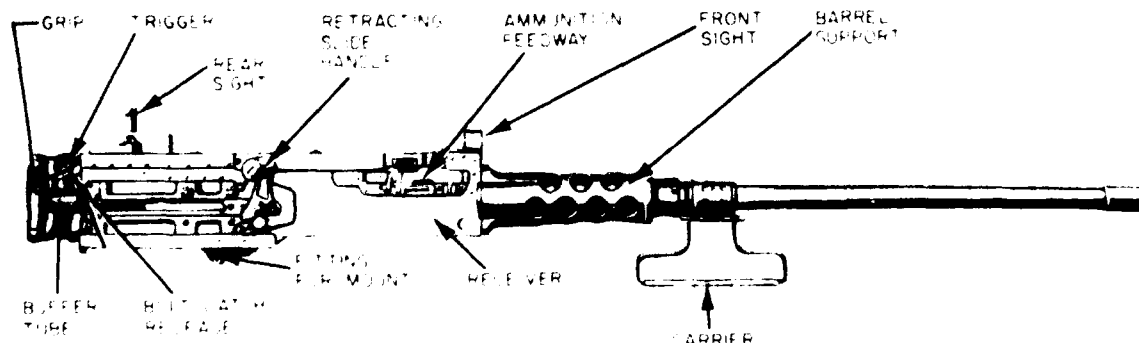


Figure 5-33.—The .50-caliber Browning machine gun (BMG), M2HB.

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two types of barrels. An aluminum alloy “light” barrel is used for the aircraft version of the .50-caliber BMG, M2. A “heavy barrel” (HB) is issued for ship and surface craft use. Our discussion centers around the .50-caliber BMG, M2HB (fig. 5-33).

GENERAL DESCRIPTION

The .50-caliber BMG is a belt-fed, crew-served, recoil-operated, air-cooled weapon. It can be set for automatic and semiautomatic fire. The .50-caliber BMG does not have any positive safeties.

Ammunition is supplied to the gun's receiver (ammunition feedway) by a disintegrating metallic link belt. The BMG is capable of alternate feed. Normally, the gun is fed from its left side; but by repositioning certain component parts, the belt may be fed from the right side.

One person can operate the .50-caliber BMG. However, two people, the gunner and assistant gunner, are normally used. The gunner actually fires the weapon. The assistant gunner helps to load and reload the ammunition into the receiver. Other personnel—ammunition bearers—can be

used to keep the assistant gunner supplied. Speed, skill, and teamwork are important.

The force for recoil is furnished by the expanding gases of the fired cartridges. The recoil operation is controlled by various springs, cams, and levers within the gun.

Most of the barrel and receiver is exposed to the air to cool the .50-caliber BMG. Perforations (holes) in the barrel support allow air to circulate around the breech end of the barrel. A heavy barrel (HB) is used to retard, or slow down, early overheating.

The .50-caliber BMG has a leaf-type rear sight. It is graduated in both meters and mils for ranges from 100 to 2,600 meters and from 0 to 62 mils. A windage knob permits deflection changes of 5 mils right or left of the center. The front sight is a semifixed blade type with a cover.

Because of its size and weight, the .50-caliber BMG usually needs some type of mounting support. Figure 5-34 illustrates the M3 tripod mount arrangement. Other devices or stands may also be used. The primary reason for mounting the weapon is to increase its firing accuracy. (Of course, if you think you are John Wayne, go ahead and shoot from the hip!)

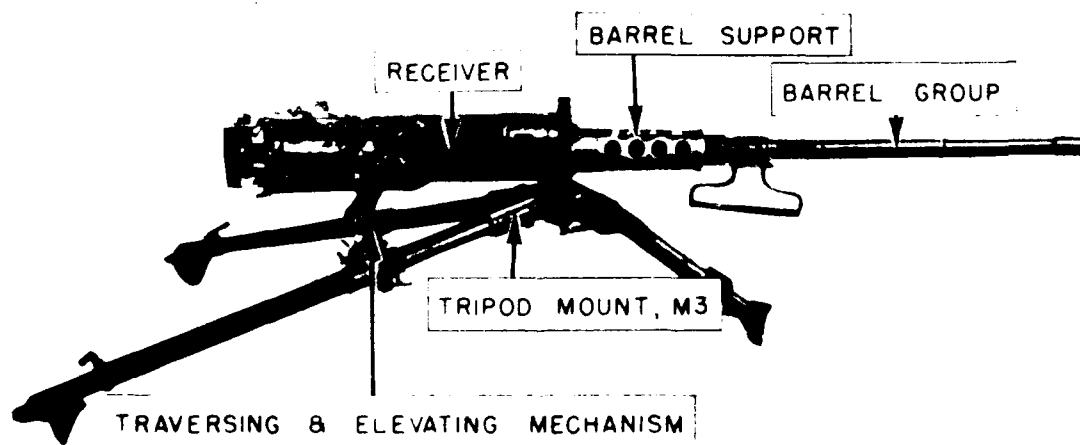
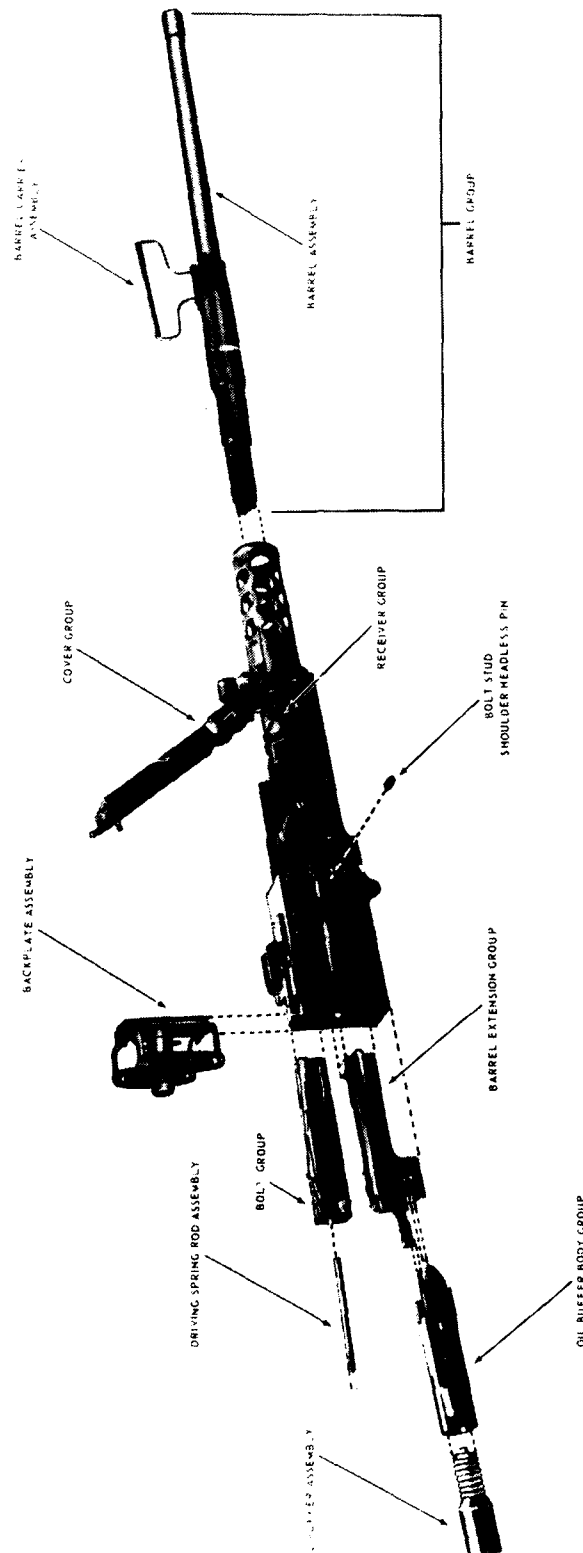


Figure 5-34.—The .50-caliber BMG on an M3 tripod mount.

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Figure 5-35.—Major component groups and assemblies.

The main characteristics of the .50-caliber BMG are listed below:

Weight of receiver group	60 lb
Weight of barrel	24 lb (approx.)
Weight of tripod mount M3 (w/traversing and elevating mechanism and pintle w/bolt)	44 lb
Total weight of gun, complete, on tripod mount, M3	128 lb (approx.)
Maximum range (M2 ball)	6800 meters (approx.)
Maximum effective range	1830 meters
Rates of fire:	
Sustained	40 rd or less per min.
Rapid	40 rd or more per min.
Cyclic rate of fire	450-550 rd. per min.
Muzzle velocity (M2 ball)	3,050 ft/sec (2,080 mph)
Length of gun, overall	65 in. (approx.)
Length of barrel	45 in.

GENERAL DISASSEMBLY

Figure 5-35 illustrates the major component groups and assemblies of the .50-caliber BMG. For routine cleaning and maintenance, you need to know the general disassembly procedures. Detailed disassembly procedures remove all parts from each group. These steps are explained in the Army's FM23-65. Be sure to consult the field manual if you must do a detailed disassembly.

Before starting general disassembly procedures, the weapon must be cleared. This includes ensuring the gun is unloaded, cocked, and the bolt is forward. The primary steps involve removal of the following parts:

1. Barrel group
2. Backplate assembly
3. Driving spring rod assembly
4. Bolt stud
5. Bolt group
6. Oil buffer body and barrel extension groups
7. Oil buffer assembly

Remove Barrel Group

The actions required to remove the barrel group are illustrated in figure 5-36. Turn the cover latch shaft lever forward and raise the cover group (view A). Pull the retracting slide (bolt) handle to the rear slowly (view B). That moves the recoiling parts of the gun to the rear.

Pull rearward until the lug on the barrel locking spring aligns with a 3/8-inch hole. The hole is in the right sideplate of the receiver, just below the feedway exit. The barrel can be turned only when the lug is aligned with the 3/8-inch hole. Place the smallest loop of a .50-caliber belt link (or suitable spacer) between the trunnion block and the barrel extension. This holds the barrel locking spring lug aligned with the 3/8-inch hole in the right sideplate (view C).

Now, unscrew the barrel from the receiver (view D). Be careful not to damage the threads or barrel-locking notches when setting the barrel down. Complete this phase of disassembly by pulling back slightly on the retracting slide handle. Then remove the .50-caliber link (or spacer) from the receiver. Do not allow the bolt to slam forward with the barrel removed; this will cause damage. Let the retracting slide handle (and bolt) ease forward carefully.

Remove Backplate Assembly

To remove the backplate assembly, refer to figure 5-37. Two conditions must exist before the backplate assembly can be removed. First, the bolt latch release must be up and free of the bolt latch release lock. If it is not, push down on the bolt latch release (fig. 5-37, view A). Turn the buffer tube sleeve to the right. Keep turning until the bolt latch release lock is free of the bolt latch release.

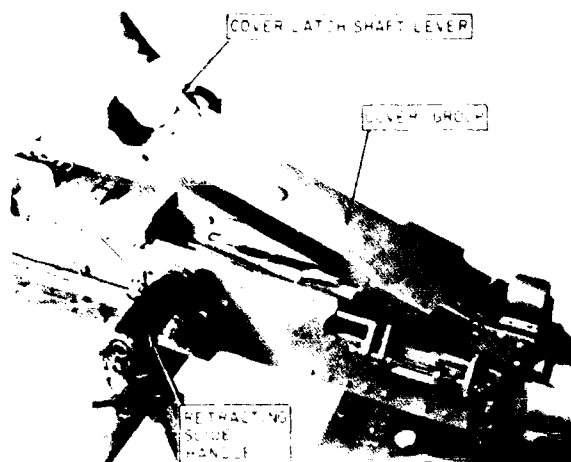
The second condition is that the bolt must be forward. If it is not, depress the bolt latch release. At the same time, use the retracting slide handle to ease the bolt forward. When the bolt latch release is up and the bolt is forward, the backplate assembly can be removed. Located below the buffer tube sleeve are the backplate latch and latch lock. Pull out on the latch lock and up on the latch as shown in figure 5-37, view B. Remove the backplate by lifting it straight up.

Remove Driving Spring Rod Assembly

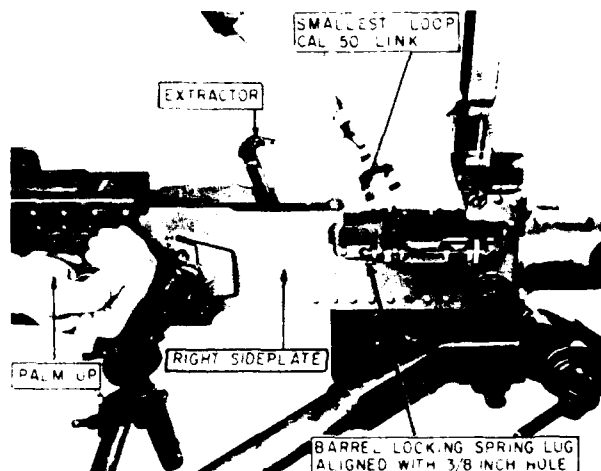
The driving spring rod assembly consists of its inner and outer springs and a rod. The

assembly is located next to the right sideplate inside the receiver (fig. 5-38).

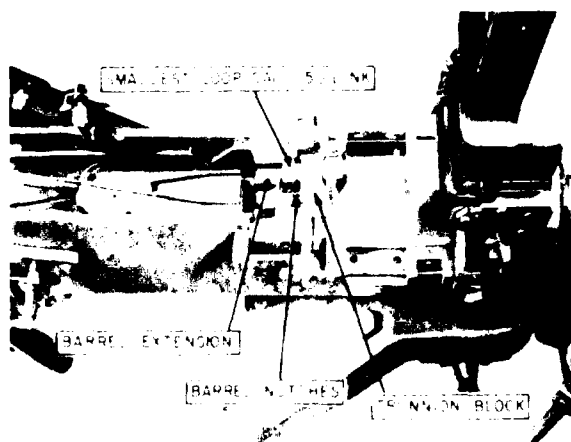
To remove the assembly, push in on the head of the driving spring rod. Push it to the left and remove the driving spring rod retaining pin from



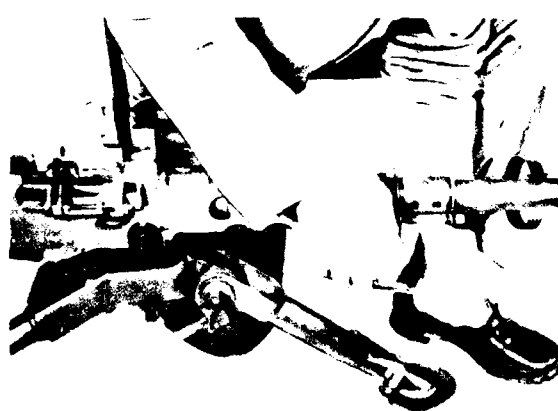
A-RAISING THE COVER GROUP.



B-ALIGNING THE LUG ON THE BARREL LOCKING SPRING WITH THE 3/8-INCH HOLE IN THE RECEIVER'S RIGHT SIDEPLATE.



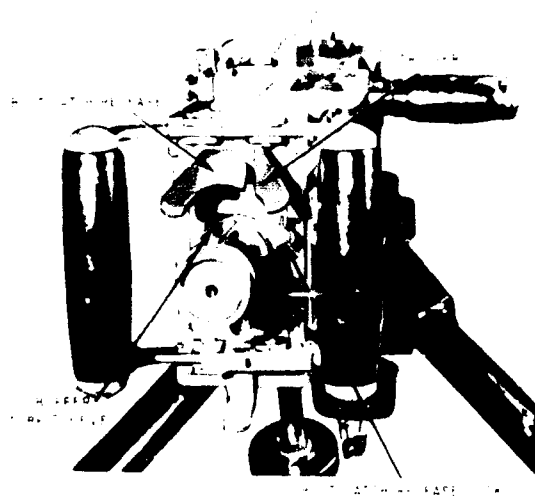
C-USING THE SMALLEST LOOP OF A 50-CAL LINK TO KEEP THE BARREL LOCKING SPRING LUG ALIGNED WITH THE 3/8-INCH HOLE



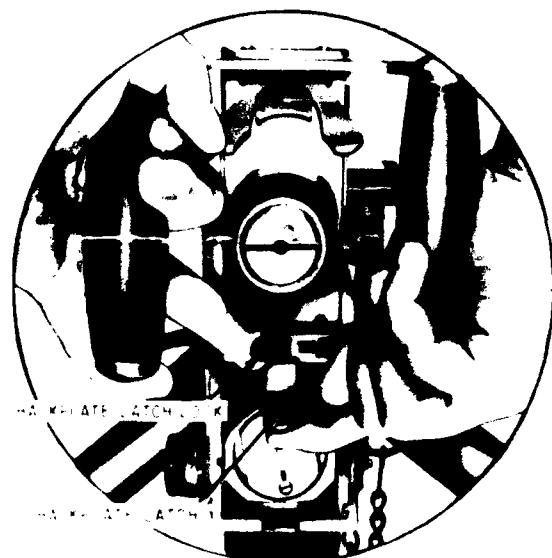
D-UNSCREWING THE BARREL GROUP FROM THE RECEIVER

Figure 5-36.—Removing the barrel group.

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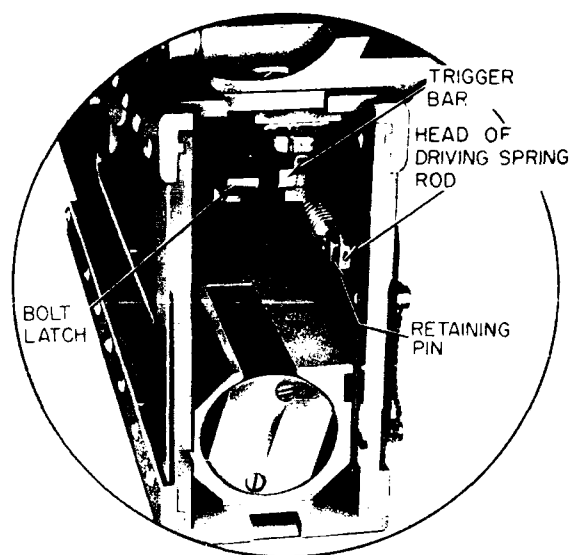
BACKPLATE LATCH RELEASE LOCK FREE OF THE BACKPLATE LATCH RELEASE



BACKPLATE LATCH RELEASE LOCK FREE OF THE BACKPLATE LATCH RELEASE

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Figure 5-37.—Removing the backplate assembly.



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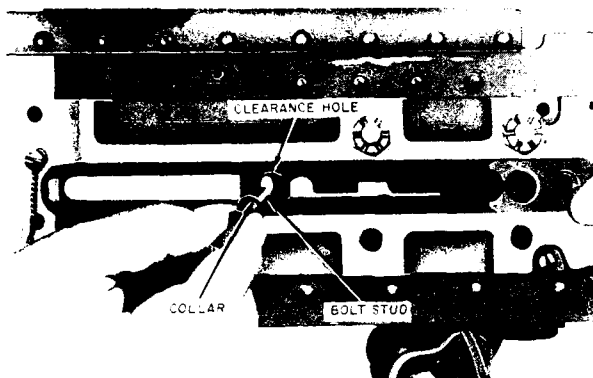
Figure 5-38.—Removing the driving spring rod assembly.

its seat in the right sideplate. Pull the complete assembly to the rear and out of the receiver.

Use caution when removing the driving spring rod assembly. You should feel a slight pressure on the springs when the bolt is forward. Never attempt to cock the gun while the backplate assembly is off and the driving spring rod assembly is installed. Cocking the gun will compress the spring group. If the retaining pin slips from its seat, the rod will come flying out! Anyone standing behind the gun will be injured.

Remove Bolt Stud

To remove the bolt stud (a shoulder headless pin), grasp the retracting slide handle. Give the handle a quick jerk moving it about halfway to the rear. That action frees the bolt group from the barrel extension group. Move the bolt rearward until the

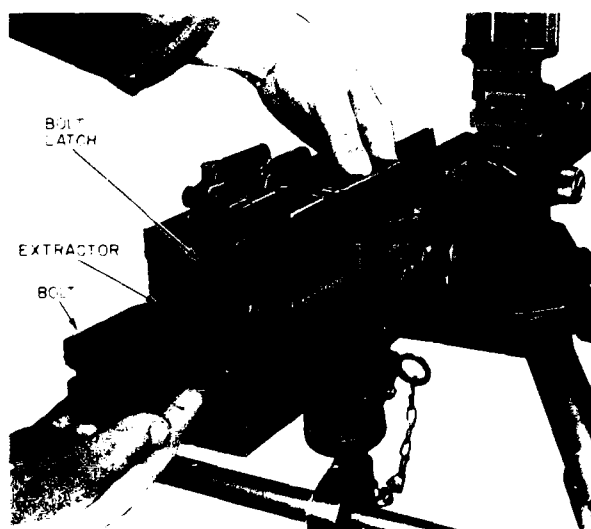


84.365

Figure 5-39.—Removing the bolt stud.

shoulder on the bolt stud aligns with a clearance hole. The hole is in the bolt slot on the right sideplate (fig. 5-39). Removing the bolt stud frees the bolt group.

If the bolt is accidentally moved all the way to the rear, it will lock in place. If that occurs, raise the bolt latch. (Refer to fig. 5-40.) Push the bolt forward to align the bolt stud with the clearance hole. Then proceed as before.



84.367

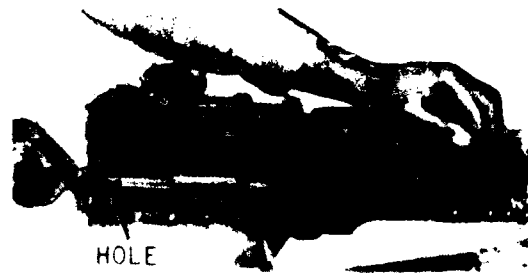
Figure 5-40.—Removing the bolt group.

Remove Bolt Group

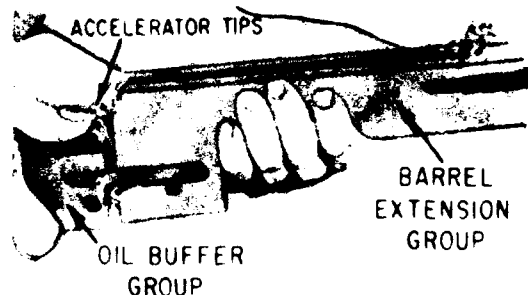
After freeing the bolt, slide it from the rear of the receiver (fig. 5-40). Place the bolt down on its right side with the extractor arm up. That prevents the extractor from falling out of the bolt.

Remove Oil Buffer Body and Barrel Extension Groups

These two groups are removed as a unit. To remove them, insert a pointed tool through a hole in the lower rear corner of the right sideplate (fig. 5-41, view A). Pushing in on the tool releases the



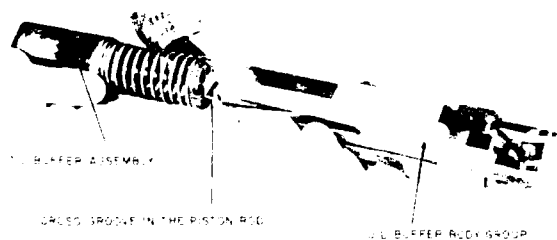
A. UNLOCKING THE OIL BUFFER BODY'S SPRING LOCK



B. SEPARATING THE OIL BUFFER GROUP AND THE BARREL EXTENSION GROUP.

84.368

Figure 5-41.—Removing the oil buffer body and barrel extension groups.



84.370

Figure 5-42.—Removing the oil buffer assembly.

spring lock of the oil buffer body. At the same time, pull and remove the two groups from the rear of the receiver.

Now separate the oil buffer body group from the barrel extension group. Hold the unit as shown in view B of the figure. Push forward on the tips of the accelerator and pull the two groups apart.

Remove Oil Buffer Assembly

To remove the oil buffer assembly, hold the buffer body as shown in figure 5-42. Pull the buffer assembly to the rear. That completes the general disassembly of the .50-caliber BMG. Limited cleaning, maintenance, and major part/group replacement can be done now.

GENERAL ASSEMBLY

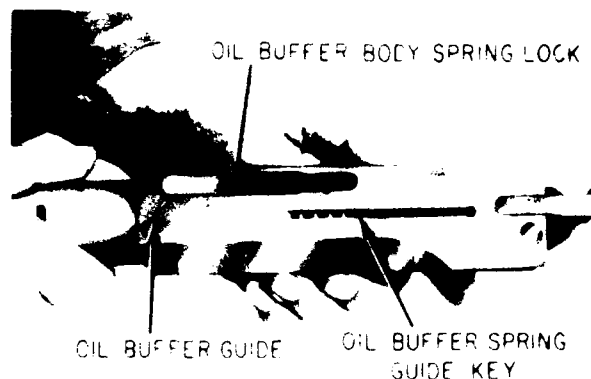
To reassemble the .50-caliber BMG, replace the major component groups in reverse order. You should follow certain procedures to do the job correctly. These procedures are explained in the following paragraphs.

Replace Oil Buffer Assembly

Slide the oil buffer assembly into the oil buffer body group, as shown in figure 5-43, view A.

Ensure the spring guide key fits into the slot in the oil buffer body.

Turn the oil buffer tube until the screwdriver slot is vertical (view B). The arrow on the tube must point to the right. The stud on the tube lock will now engage the serrations in the oil buffer tube. That keeps the tube from turning. Push the oil buffer assembly all the way forward.

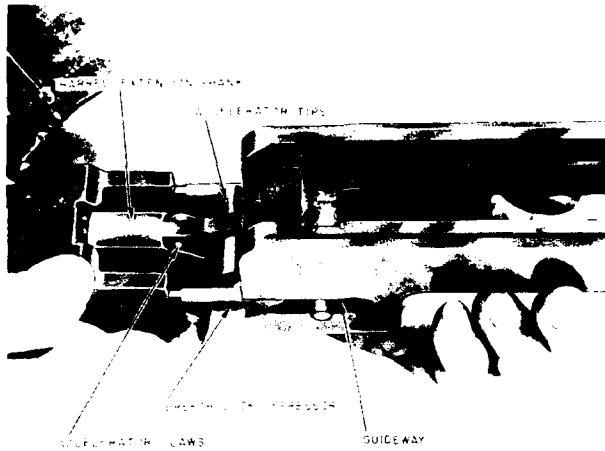


A. SLIDING OIL BUFFER ASSEMBLY INTO OIL BUFFER BODY.

B. ENSURE SCREWDRIVER SLOT IS VERTICAL AND ARROW POINTS TO THE RIGHT

84.372

Figure 5-43.—Replacing the oil buffer assembly.



84.374

Figure 5-44.—Joining the oil buffer body and barrel extension groups.

Replace Oil Buffer Body and Barrel Extension Groups

Figure 5-44 illustrates how these two groups are joined together. Align the breech lock depressors with their guideways in the barrel extension. Also engage the barrel extension shank to the accelerator claws as shown.

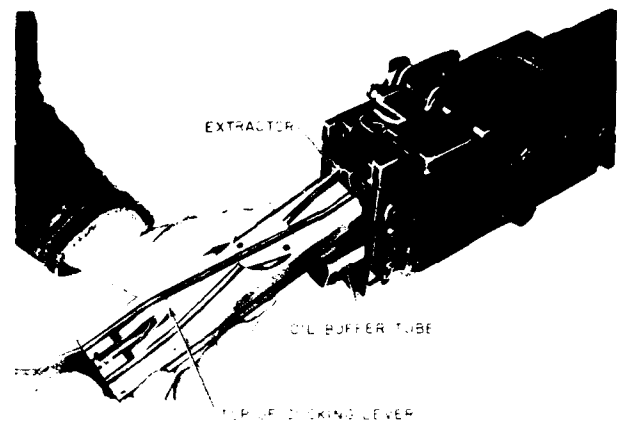
Push the two groups together. Press down on the accelerator tips to ensure the two groups are locked together. Place them into the rear of the receiver. Push them forward until the oil buffer body spring lock (fig. 5-43, view A) snaps into place. Properly locked in place, the oil buffer tube should protrude about 1 1/8 inch from the rear of the oil buffer body group.

Replace Bolt Group

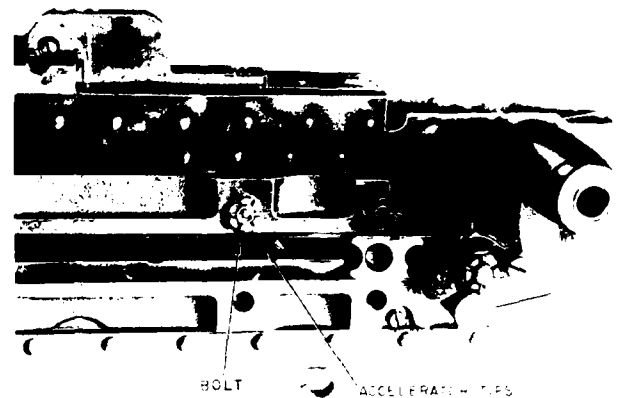
Figure 5-45 illustrates how the bolt group is replaced into the receiver. The top of the cocking lever must be forward and the extractor must be down (flat), as shown in view A.

Push the bolt forward, maneuvering it so the front end clears the accelerator tips, as shown in view B. That condition can be seen through the receiver's sideplate. Continue pushing the bolt forward until the bolt latch engages the notches in the top of the bolt.

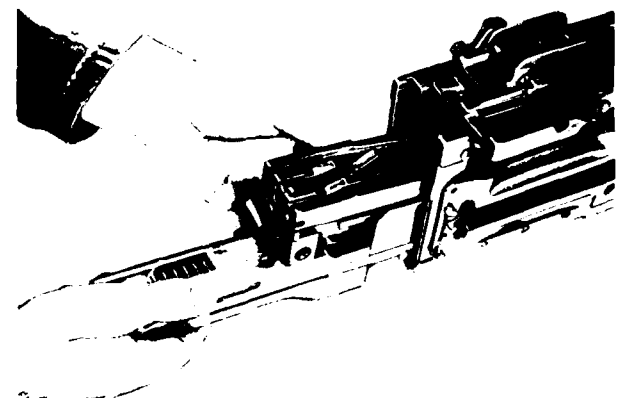
View C of the figure illustrates an optional procedure. The oil buffer body, barrel extension,



A— PLACING BOLT INTO RECEIVER.



B— BOLT CLEARING ACCELERATOR TIPS.



C— REPLACING OIL BUFFER BODY, BARREL EXTENSION, AND BOLT GROUPS AS A UNIT.

84.375

Figure 5-45.—Replacing the bolt group.

and bolt groups can be assembled outside the receiver. Then, all three groups are inserted as a single unit.

Replace Bolt Stud

The actions required to replace the bolt stud are almost the same as those required to remove it. (Refer to figure 5-39.) Align the stud hole in the bolt with the clearance hole in the right sideplate. Ensure the shoulder of the stud fits inside the sideplate.

Replace Driving Spring Group

To replace the driving spring group, press up on the bolt latch. Move the bolt all the way forward by pushing on the bolt stud only. Place the end of the driving spring rod in its hole in the back of the bolt. Then, push forward on the driving spring groups and the oil buffer tube. Press in and push the head of the rod to the right. Insert the retaining pin in its seat in the right sideplate. (Refer to figure 5-38.)

Replace Backplate Assembly

To replace the backplate, hold its latch down and the trigger up. Position the backplate guides in their guideways. Hold the latch lock out and slide the backplate down until the latch snaps into place, as shown in figure 5-46. Release the latch lock and tug up on the backplate assembly to ensure it is firmly seated.

Replace Barrel Group

To replace the barrel group, pull the retracting slide handle to the rear. Do so until the lug on the barrel locking spring is visible through the 3/8-inch hole in the right sideplate. (Refer to fig. 5-36.) Again, insert the smallest loop of a .50-caliber link, or suitable spacer, between the trunnion block and barrel extension.

Screw the barrel all the way into the barrel extension. Then, and this is important, unscrew the barrel two notches. Remove the link and close the cover group. That completes the general assembly of the .50-caliber BMG.



84.422

Figure 5-46.—Replacing the backplate assembly.

OPERATING THE .50-CALIBER BMG

The safest and best way to operate the .50-caliber BMG is to follow established procedures. In doing so, you will prevent damage to the gun and injury to yourself and others. The basic operating procedures involve the following steps:

1. Loading
2. Half-loading
3. Full-loading
4. Unloading

SEMI-AUTOMATIC OPERATION

If single-shot firing is desired, the gun must be set for semiautomatic operation. To do so, you must ensure the bolt latch release is in the up position (or not locked down). (The bolt latch release can be seen in view A of figure 5-37.)

When the bolt latch release is up, the bolt latch assembly is depressed. In this position, the latch assembly can engage notches on top of the bolt when it (the bolt) is to the rear. Thus, when the bolt recoils after a round is fired, it remains locked to the rear.

Depressing the bolt latch release raises the latch assembly. The assembly disengages from the notches on top of the bolt. That allows the bolt to be driven forward into battery.

To fire the .50-caliber BMG when set for semiautomatic, (1) depress the bolt latch release and (2) depress the trigger. These two actions must be done for each round fired.

AUTOMATIC OPERATION

If automatic firing is desired, the gun must be set for automatic operation. To do so, you must ensure the bolt latch release is depressed and locked down. You do this by turning the buffer tube sleeve. You rotate the bolt latch release lock to engage the bolt latch release and lock it down. (Refer to view A of figure 5-36 again.)

When the bolt latch release is locked down, the bolt latch assembly remains in its up position. Thus, when the bolt recoils, it is automatically free to return forward into battery.

To fire the .50-caliber BMG in automatic, (1) lock down the bolt latch release and (2) depress the trigger. Short bursts are generally recommended rather than sustained firings.

LOADING OPERATION

The .50-caliber BMG is loaded manually. The gunner must place an ammunition belt into the receiver of the gun. Ammunition for the .50-caliber BMG comes prebelted and is shipped in a standard .50-caliber ammunition box.

To load the gun, open and remove the lid on the ammunition box. Then open and raise the cover group on the gun (fig. 5-47). Insert the double-loop end of the ammunition belt into the feedway of the receiver. Ensure the first cartridge is held by the belt-holding pawl. Close the cover group on the gun and make sure it is latched securely.

If two personnel are operating the .50-caliber BMG, the assistant gunner loads the ammunition

belt. The gunner performs the next two operations—half-loading and full-loading.

HALF-LOADING OPERATION

Half-loading is a term associated with the .50-caliber BMG. It can be compared to feeding. Feeding is the first of eight steps in a cycle of operation. It places a round in the receiver just to the rear of the receiver. Don't confuse loading the .50-caliber BMG (described earlier) with half-loading. The two operations are different.

Half-loading the gun is done after the ammunition belt is installed and the cover group closed. To half-load the gun, the gunner grasps the retracting slide handle, pulls it smartly to the rear, and releases it. At this point, two things can occur. What happens depends on whether the gun is set for automatic or semiautomatic fire.

When the gun is set for automatic fire, the bolt latch release lock holds the bolt latch release down. When the retracting slide handle is released, it and the bolt will go forward. They are driven forward under pressure from the driving spring group. The gun is now half-loaded (in automatic).

When the gun is set for semiautomatic fire, the bolt latch release is up. When the retracting slide handle is released, it and the bolt will remain to the rear. To complete the half-load operation, the gunner must do two things. First, the retracting slide handle must be pushed all the way forward. Second, the bolt latch release must be depressed. That unlocks the bolt and it drives forward. The gun is now half-loaded (in semiautomatic).

Can the .50-caliber BMG be fired now that it is half-loaded? The answer is no. Half-loading only places a round into the receiver behind the barrel. The round must be chambered before it can be fired.

FULL-LOADING OPERATION

Full-loading a .50-caliber BMG can be compared to chambering. Chambering was the second of eight steps in a cycle of operation. It places a new round in the gun's chamber.

To full-load the gun, you must repeat the half-loading sequence. Pull the retracting slide handle to the rear and release it. The weapon is now ready to fire.

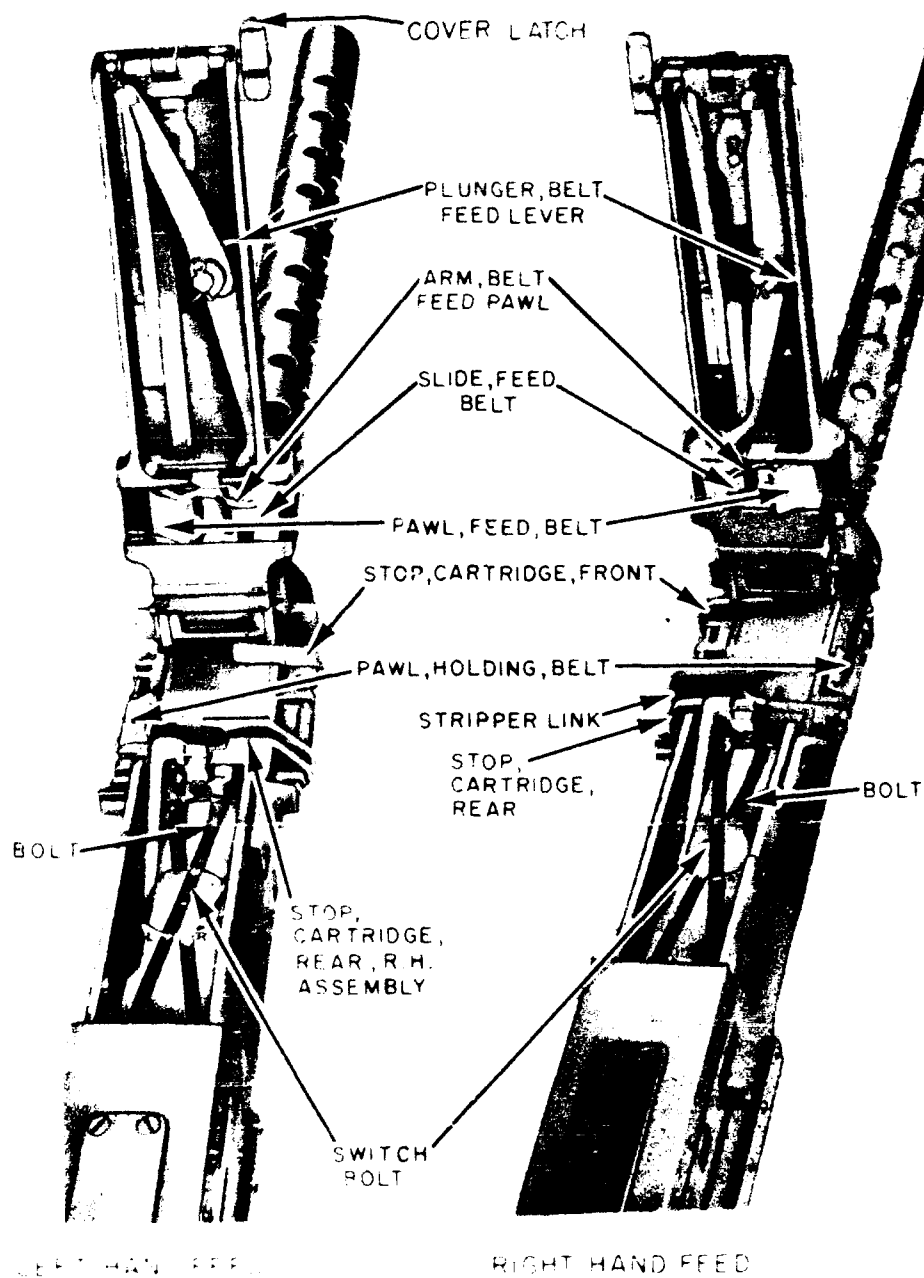


Figure 5-47.—Receiver's feeding mechanism parts set up for left-hand and right-hand feeding.

84.114

UNLOADING OPERATION

To unload a .50-caliber BMG, unlock the bolt release latch (if applicable) and open the cover group. Lift the ammunition belt out of the feedway. Pull the retracting slide handle to the rear and lock the bolt. Look and/or feel to make sure no ammunition is in the gun.

If the weapon is clear, lower the extractor. Release the bolt and ease the retracting slide handle forward. Then lower and secure the cover group. To complete unload operations, depress the trigger to uncock the firing mechanism.

CYCLE OF OPERATION

The first two steps of the eight-step cycle of operation have already been discussed. Initial feeding and chambering are accomplished during the manual half- and full-loading operations. After the first round is fired, feeding and chambering are done by the action of the gun.

The remaining steps in the cycle of operation of a .50-caliber BMG are summarized below.

1. Locking—The bolt is locked to the barrel and barrel extension.

2. Firing—The firing pin is released and driven forward to strike the primer of the cartridge.

3. Unlocking—The bolt unlocks from the barrel and barrel extension.

4. Extracting—The empty cartridge case is pulled from the chamber.

5. Ejecting—The empty cartridge case is ejected from the receiver.

6. Cocking—The firing pin is withdrawn into its cocked position.

You can follow most of the operating cycle of the gun by referring to figure 5-48. Assume the chamber is loaded, the gun is cocked, and the bolt latch is released. When the trigger is depressed, the trigger bar pivots and releases the cocked firing mechanism. The spring-loaded firing pin strikes the primer and the cartridge fires. Pressure from the expanding gases causes the recoiling parts of the gun to start moving rearward.

During the first three-fourths of an inch of rearward travel, the recoiling parts remain locked together. However, the breech lock depressors are acting on the breech lock pin. That action forces the breech lock down and out of the bolt. As a result, at the end of the first three-fourths of an

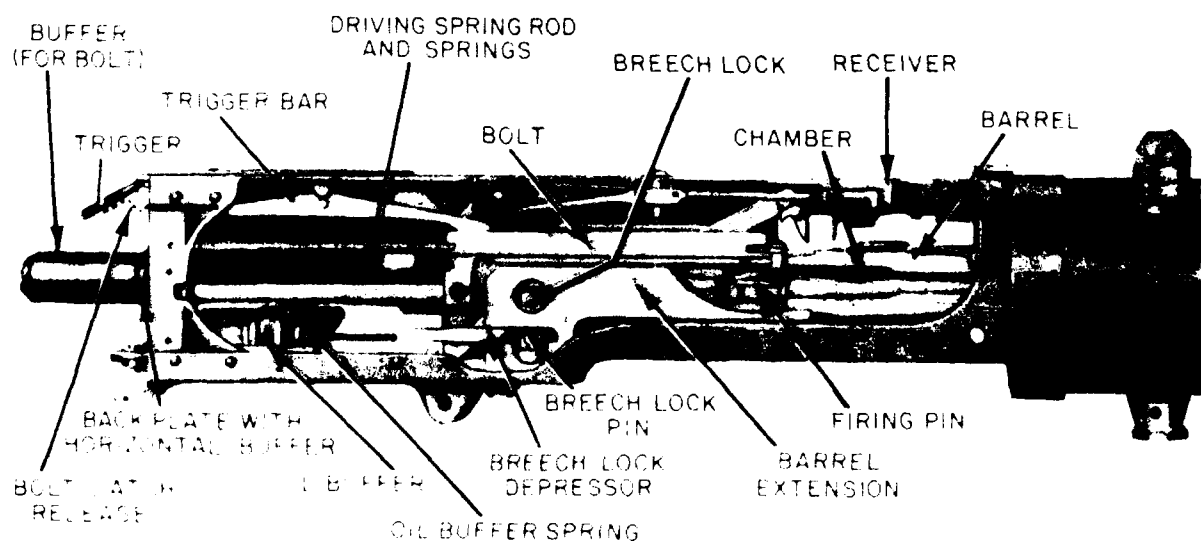


Figure 5-48.—The .50-caliber BMG receiver; cutaway view.

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inch of recoil, the bolt is unlocked. It is free to continue recoiling independent of the barrel and barrel extension.

The barrel extension hits the accelerator. It, in turn, hits the bolt and accelerates it (the bolt) to the rear. The barrel and barrel extension recoil another 3/8 inch (1 1/8 inch total travel). They are stopped by the oil buffer assembly.

Meanwhile, the bolt recoils an additional 6 3/8 inches to the rear (7 1/8 inches total travel). During this movement, the driving spring group is compressed and the bolt is stopped by the bolt buffer mechanism. The fired cartridge is extracted, and the firing mechanism is cocked.

Counter recoil forces the bolt forward, and the empty cartridge case is ejected. The bolt locks to the barrel extension and both move forward into battery. Feeding and chambering have taken place and the gun is ready to fire. The cycle begins when the firing pin is released to set off the next cartridge.

HEADSPACE AND TIMING ADJUSTMENTS

By now, you should realize that the .50-caliber BMG is a complex-working machine. The care and maintenance given this gun are critical for safe and continued operation. In addition to normal lubrication and cleaning practices, checking and adjusting the headspace and timing of the weapon are mandatory.

Headspace Adjustment

Headspace is the distance between the face of the bolt and the base of a seated cartridge case. The distance is correct when the following conditions are met:

1. The recoiling groups are fully forward.
2. There is no independent rearward movement between the bolt, barrel, and barrel extension.

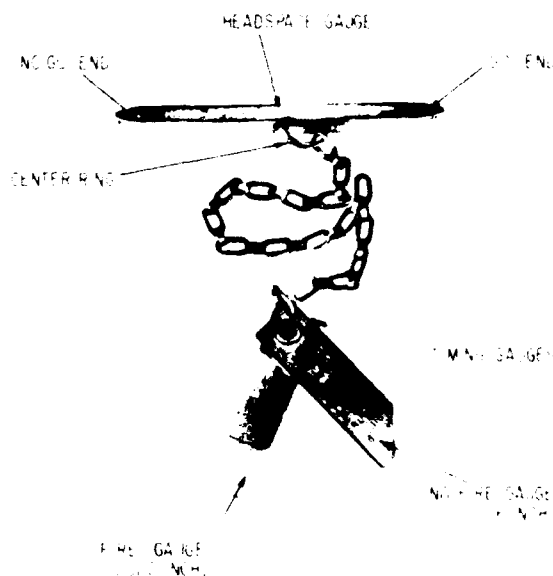
Improper headspace adjustment can cause a lot of problems. It will cause the gun to operate improperly and, frequently, will cause damage to the weapon or injury to personnel.

Headspace must be checked and set before the gun is fired. Other instances when it must be checked include the following:

1. When the gun is assembled
2. When the barrel or any major group or assembly within the receiver is replaced
3. When there is doubt that correct headspace is set

A special tool is used to check and set the headspace distance. It is called the *headspace gauge* and is part of the headspace and timing gauge set (fig. 5-49). The tool should be kept with the gun at all times. For now, we're only interested in the GO/NO GO headspace gauge. The following steps explain how to check and set the headspace adjustment.

1. With the cover group closed, cock the gun. Do so by pulling the retracting slide handle all the way to the rear.
2. Depress the bolt latch release and slowly ease the restricting slide handle and bolt all the way forward.



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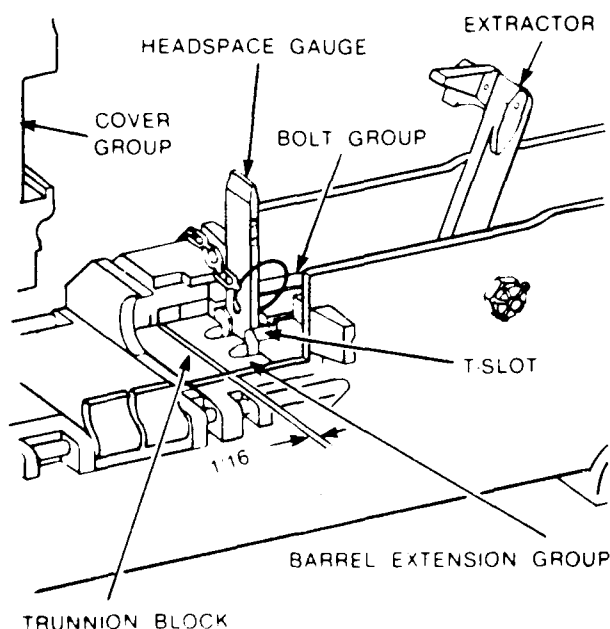
Figure 5-49.—Headspace and timing gauge set.

3. Raise the cover group. Pull back on the retracting slide handle slightly. Move the bolt not more than one-sixteenth of an inch to the rear. That prevents the driving spring group and the weight of the parts from giving a false reading. Raise the extractor.

4. Insert the GO end of the headspace gauge into the T-slot. The T-slot is between the face of the bolt and the rear of the barrel, as shown in fig. 5-50. The GO end of the gauge should enter the T-slot freely up to the center ring of the gauge. Remove the gauge and try to insert the NO GO end into the T-slot. If the NO GO end will not enter the slot, headspace distance is correct.

HEADSPACE TOO TIGHT.—If the headspace is too tight, the GO end of the gauge cannot enter the T-slot freely. To correct this situation, take the following steps.

1. Pull back on the retracting slide handle. Do so until the lug on the barrel locking spring is visible through the 3/8-inch hole in the right sideplate. (Refer to fig. 5-36.)
2. Unscrew the barrel one notch (click).
3. Ease the retracting slide handle and bolt fully forward.



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Figure 5-50.—Checking the headspace with the GO end of the headspace gauge.

4. Retract the bolt slightly, not exceeding one-sixteenth of an inch (fig. 5-50). Recheck the headspace adjustment as before.

If necessary, repeat this procedure to obtain the proper adjustment. Be sure to unscrew the barrel only one notch (click) each time. If the adjustment cannot be made within one to five (maximum) notches (clicks), notify the maintenance supervisor.

HEADSPACE TOO LOOSE.—If the headspace is too loose, the NO GO end of the gauge will enter the T-slot freely. The adjustment procedures for this situation are the same as those just described. However, screw the barrel in one notch (click) at a time for each adjustment attempt.

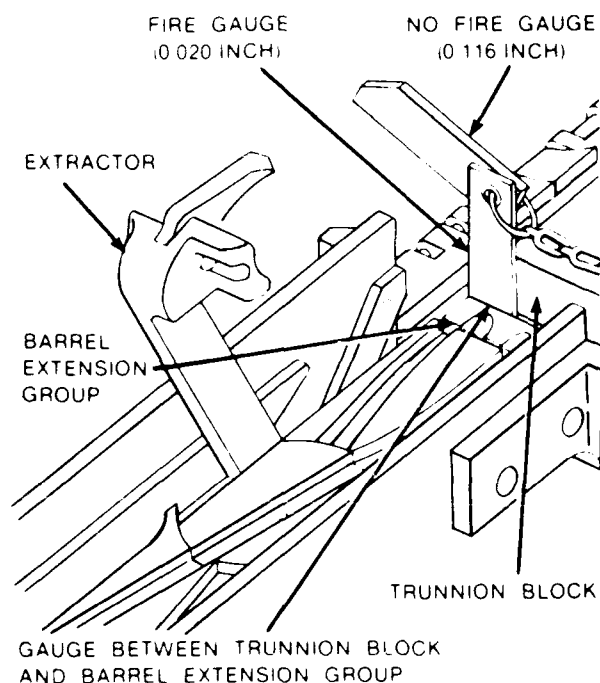
Timing Adjustment

Timing of the weapon is as critical as headspace adjustment. Timing ensures that firing takes place when the recoiling parts are between .020 and .116 inch out of battery. That prevents contact between the front end of the barrel extension and the trunnion block. Timing is correct when the following conditions are met:

1. The recoiling parts are locked together.
2. Firing takes place just before the recoiling parts are in battery (fully forward).
3. The gun fires on the FIRE gauge and does not fire on the NO FIRE gauge.

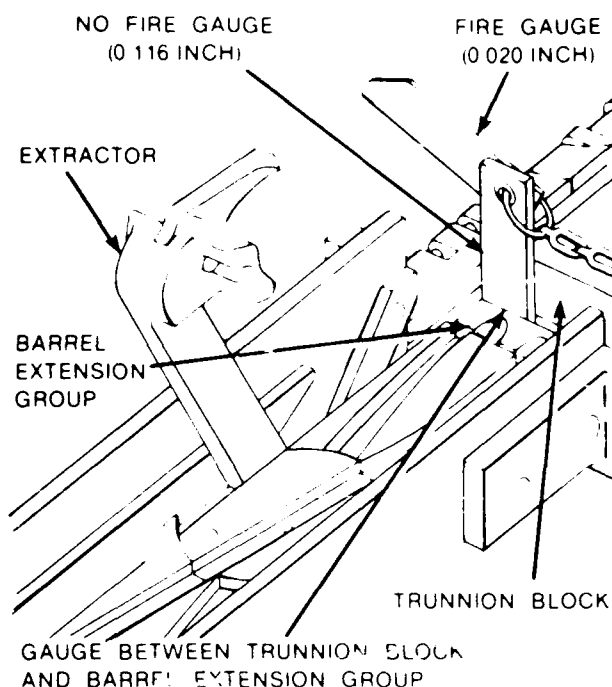
The timing of the gun is checked with the FIRE (.020 inch) and NO FIRE (.116 inch) gauges seen in figure 5-49. Timing must be checked and/or set (1) each time headspace is adjusted and (2) whenever the timing is questionable. The following steps explain how to check and set the timing adjustment:

1. Ensure the headspace adjustment is correct. If not, correct it before checking the timing.
2. Ensure the firing pin is cocked and the recoiling parts are forward in battery position.
3. Raise the extractor.
4. Retract the recoiling parts enough to insert the FIRE (.010 inch) gauge. Place it between the barrel extension and trunnion block (fig. 5-51).
5. Allow the barrel extension to close on the gauge slowly.
6. Depress the trigger. The firing pin should release. Releasing indicates that the timing is correct (or not late).



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Figure 5-51.—Checking the timing with the fire gauge installed.



83.556

Figure 5-52.—Checking the timing with the NO FIRE gauge installed.

7. Retract the recoiling parts enough to remove the FIRE gauge. Cock the gun and allow the recoiling parts to go forward into battery.

8. Retract the recoiling parts enough to insert the NO FIRE (.116 inch) gauge. Place it in the same location, between the barrel extension and the trunnion block (fig. 5-52).

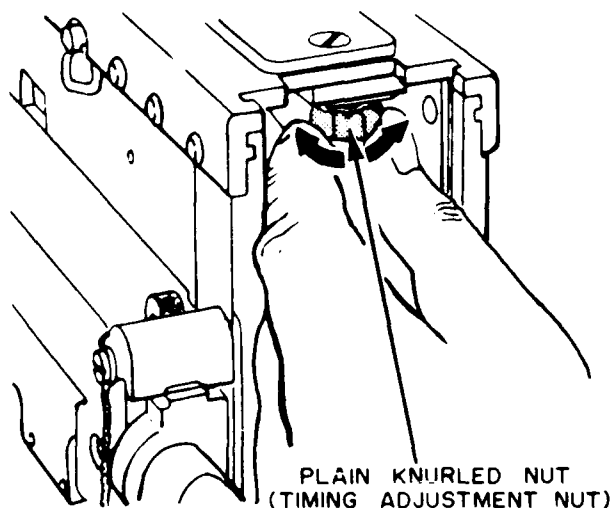
9. Depress the trigger. The firing pin should not release. Its failure to release indicates that the timing is correct (or not early).

LATE TIMING ADJUSTMENT.—If the timing of the gun is late, the firing pin will not release with the FIRE gauge installed. (Refer to step 6 above.) To correct this situation, perform the following steps:

1. Retract the recoiling parts enough to remove the FIRE gauge. Allow them to return forward into battery.

2. Remove the backplate assembly. (Refer to fig. 5-36.)

3. Locate and turn the trigger bar adjusting nut one notch to the right (fig. 5-53).



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Figure 5-53.—Turning the trigger bar adjusting nut: Turn to the right to correct for late timing; turn to the left to correct for early timing.

4. Reinstall the backplate assembly. (Refer to fig. 5-46.)

5. Retract the recoiling parts enough to insert the FIRE gauge again. Allow the barrel extension to close on the gauge slowly.

6. Depress the trigger. The firing pin should release.

If necessary, repeat the procedure until the firing pin releases with the FIRE gauge installed.

EARLY TIMING ADJUSTMENT.—If the timing of the gun is early, the firing pin will release with the NO FIRE gauge installed. The adjustment procedures for this situation are the same as those described above. However, turn the trigger bar adjusting nut one notch to the left. Reinstall the NO FIRE gauge and depress the trigger. The firing pin should not release. Repeat the procedure as necessary.

The importance of obtaining the correct headspace and timing adjustments on the .50-caliber BMG cannot be stressed enough. The field manual (FM23-65) and appropriate MRCs for the weapon describe the required procedures in detail. Consult those references to make these adjustments. Do them carefully and deliberately.

66-MM LIGHT ANTITANK WEAPON SYSTEM, M72 SERIES (LAW)

The LAW is a lightweight, self-contained antitank system consisting of a rocket packed within its own launcher. It is considered a munition rather than an individual arm and is designed to be carried and employed by designated personnel in addition to their individual weapons. The LAW will provide increased firepower against targets ranging from personnel to heavy tanks. When issued, the launcher serves as a watertight packing container for the rocket; however, when the launcher is placed in the firing position, it serves to ignite and guide the rocket on its initial flight toward the target. Once fired, the launcher is designed to be discarded.

LAUNCHER

The launcher is composed of a tube within a tube. Both tubes are telescoped to an open position for firing (fig. 5-54.)

1. *Outer tube.* The outer tube is made of high strength, plastic-impregnated fiberglass and has the following parts affixed to it: the trigger

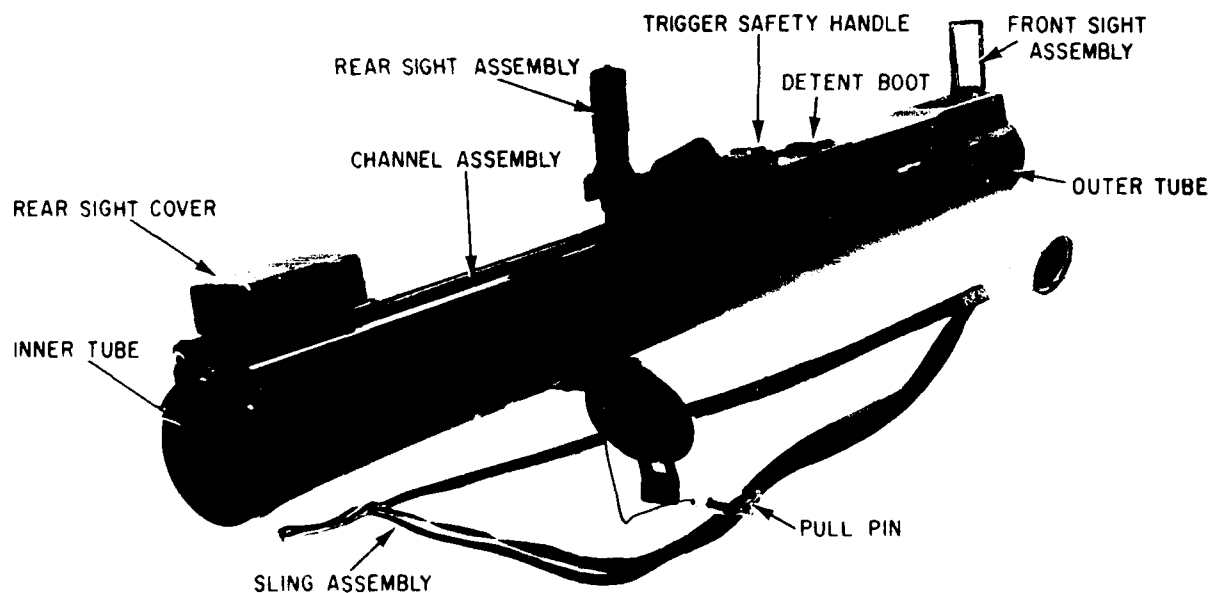


Figure 5-54.—M72A1 rocket launcher in open position.

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assembly, trigger safety handle, rear sight assembly, front sight assembly, and rear cover (fig. 5-55).

2. *Inner tube.* The inner tube is constructed of high-strength aluminum. It fits within the outer tube and will extend telescopically along the channel assembly that houses the firing pin rod assembly and locks the launcher in the extended position through the detent lever assembly.

The firing pin rod assembly locks under the trigger assembly and cocks the weapon upon extension.

ROCKET

The rocket (fig. 5-56) is made up of the 66-mm HEAT warhead M18, the point-initiating, base-detonating fuse M412, and the rocket motor M54.

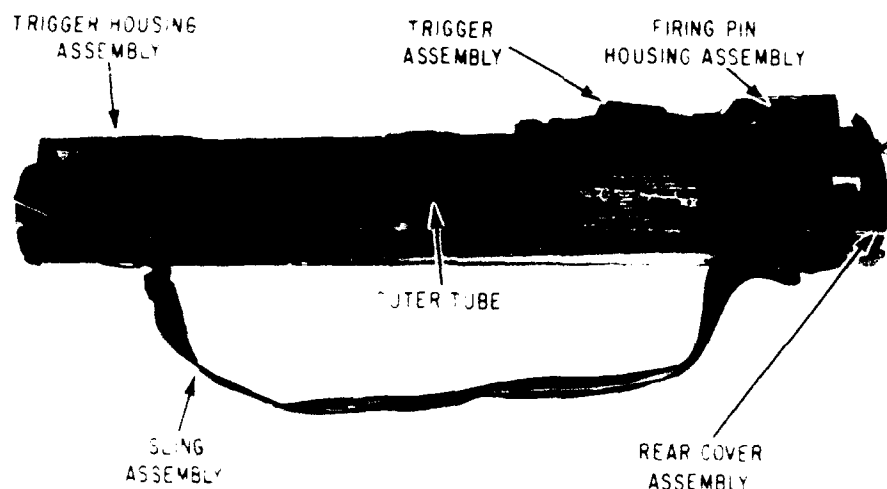


Figure 5-55.—M72A1 rocket launcher in closed position.

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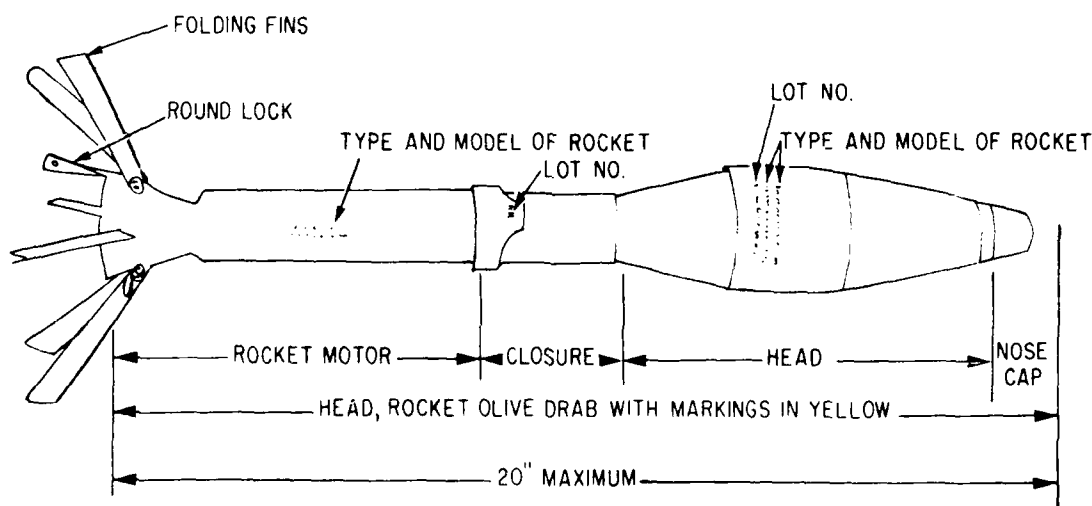


Figure 5-56.—Rocket, 66-mm, HEAT.

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SEABEE COMBAT HANDBOOK

Attached to the nozzle of the rocket motor are six spring-loaded fins which are folded forward along the motor when the rocket is within the launcher. Once the rocket motor has been ignited, all of the propellant is burned before the rocket leaves the launcher. The momentum of the rocket carries it to the target.

HEAT Rocket Characteristics

Ammunition for the M72 series is issued in the form of complete rounds of fixed ammunition packed in the launcher. The term *fixed* used in conjunction with ammunition signifies that the propelling charge cannot be changed. The complete weapon system consists of the launcher and rocket. The only designated rocket for the launcher is high explosive antitank (HEAT). The rocket components (fig. 5-57) are the M54 rocket motor, the M412 fuze, and M18 warhead. The rocket is 20 inches long, weighs approximately 2 1/4 pounds, has a muzzle velocity of about 475 feet per second, and has an approximate maximum range of 1,000 meters.

Functioning of the Rocket

The 66-mm HEAT rocket warhead, M18, consists of a tapered, thin-gauge steel body. It is cylindrically shaped and contains a shaped charge composed of two-thirds of a pound of octol explosive held in place by a thin copper cone. When detonated, the force and heat of this explosive is focused by the copper cone, forming a small but powerful jet. The forward end of the head, called the ogive, is made of thin metal and is hollow. The ogive holds the shaped charge at the required distance from the target to obtain the maximum effect of the jet. This distance is called standoff. The jet penetrates the target and, in the case of armor, causes particles to be knocked off the inside surface. If the jet hits the engine or the ammunition storage, it will start a fire or cause an explosion.

ROCKET USES

The HEAT rocket is used primarily against armor. It can be used against secondary targets

such as gun emplacements and pillboxes with excellent results. It can also be used against snipers or troops in the open.

DATA

Launcher:

Length (firing position) 35 inches (approx.)

Length (closed position) 25 inches (approx.)

Weight (complete system) 4 3/4 pounds (approx.)

Weight (launcher only) 2 1/2 pounds (approx.)

Sights:

Front Reticle graduated in 25-meter range increments, 15-mile-per-hour leads.

Rear Peepsight adjusts automatically to temperature changes.

Rocket:

Length 20 inches (approx.)

Weight 2 1/4 pounds (approx.)

Muzzle velocity 475 feet per second at 700°F

Maximum range 1000 meters (approx.)

Maximum effect range 200 meters (based on an average for both moving and stationary targets).

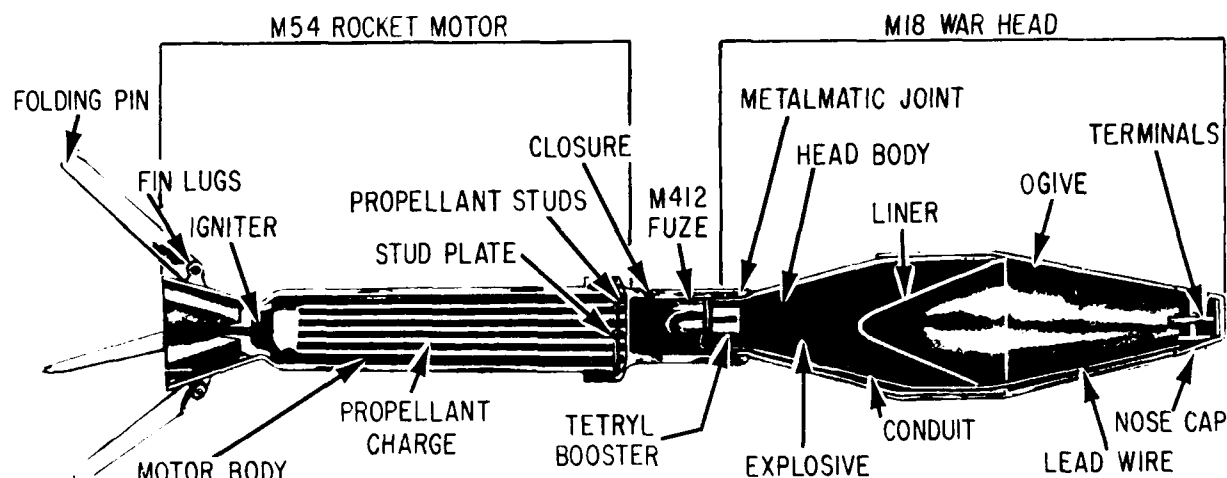
Type used Heat and practice

Armor penetration 0°
obliquity) 11 inches

CONTROLS

The *firing mechanism* consists of the trigger assembly and the firing pin.

1. *Trigger assembly.* The trigger assembly is located on the top rear of the outer tube. The trigger is in the configuration of a bar, which must be depressed to fire. When the trigger bar is depressed, it will release the tension on the firing pin rod assembly, which strikes the center of the primer.



187.189

Figure 5-57.—Nomenclature of 66-mm HEAT rocket.

2. *Firing pin housing.* The firing pin housing is affixed to the top rearmost portion of the rear or inner tube. Closely associated with the housing is the firing pin rod assembly, firing pin rod spring, primer block, primer, and rear sight cover. The primer is located on line with the firing pin.

Trigger safety handle and recocking. The trigger safety handle must be pushed forward to the release position before the trigger can be depressed. This safety should not be released until the launcher is in the correct firing position on the gunner's shoulder. On the M72A1 the trigger safety is a positive safety. When it is placed in the S (safe) position, the firing pin rod assembly cannot move to the rear and strike the primer. Cocking is accomplished in the last inch of travel upon extension; therefore, the weapon must be closed at least this far to recock it.

OPERATION

To prepare the launcher for firing, the gunner can refer to the illustrated firing instructions label located on the left side of the launcher (fig. 5-58). These instructions are discussed below.

Remove the sling assembly (fig. 5-59). Remove the pull pin and rotate the rear cover downward, thereby allowing the front cover and adjustable sling assembly to fall free; however, do not discard the sling assembly until the rocket is fired.

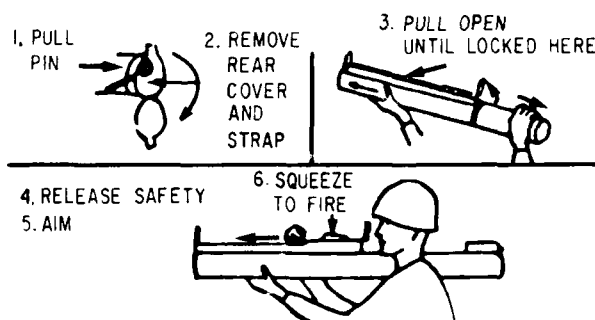


Figure 5-58.—Firing instruction label (left side of launcher).

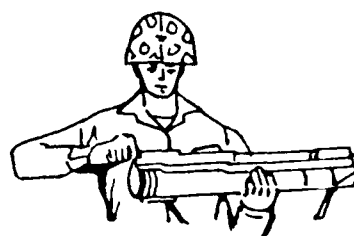
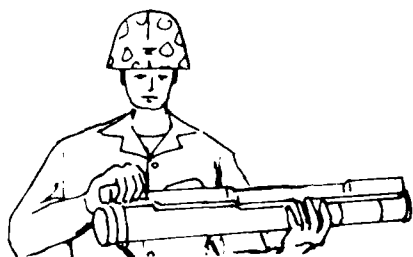
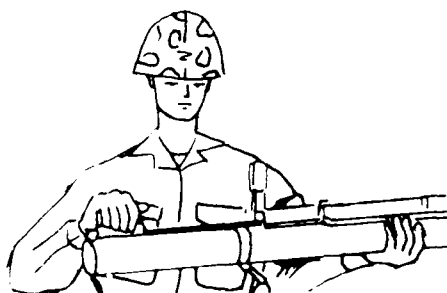


Figure 5-59.—Removal of sling assembly.



A. PREPARING TO EXTEND LAUNCHER



B. LAUNCHER EXTENDED

Figure 5-60.—Extending the launcher.

Extend the launcher (fig. 5-60). Grasp the rear sight cover and sharply pull the launcher to the rear until it locks into position. Extending the launcher slowly can result in a failure to cock the launcher.

Pull safety to arm (fig. 5-61). Check the backblast and then place the launcher on your shoulder; pull the safety to the arm position and aim the launcher (if the trigger safety handle will not remain in the arm position, the launcher is not fully extended).

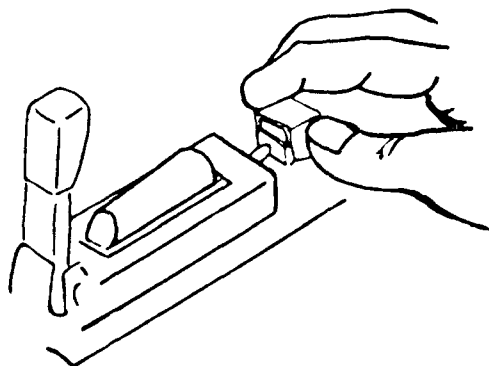


Figure 5-61.—Pull safety to arm.

Caution—During the operation procedures listed above, keep the launcher pointed down range; ensure that all parts of your body are clear of the launcher end. Be sure to check the backblast area to see that it is clear before placing the weapon on your shoulder.

Firing. To fire the launcher, depress the trigger bar (fig. 5-62).

Returning launcher to carry position. If the launcher is prepared for firing but is not fired, you may return it to the carry position by reversing the preparation procedure. Return the trigger safety handle to the SAFE position and depress the detent. Partly collapse the launcher tube, guide the front and rear sights into position, then completely collapse the tube. Replace the rear cover and pull pin, and replace the front cover and sling assembly.

Carrying the launcher. The launcher can be carried by use of the adjustable sling. Adjust it to fit comfortably and carry it with the muzzle (forward) end down.

FUNCTIONING

When the trigger is depressed, the firing pin rod assembly is released. The firing pin rod spring drives the firing pin rod to the rear and into the primer. The primer ignites a black powder in the flash tube, which initiates the igniter of the rocket motor. The igniter activates the propellant in the rocket motor (fig. 5-63).

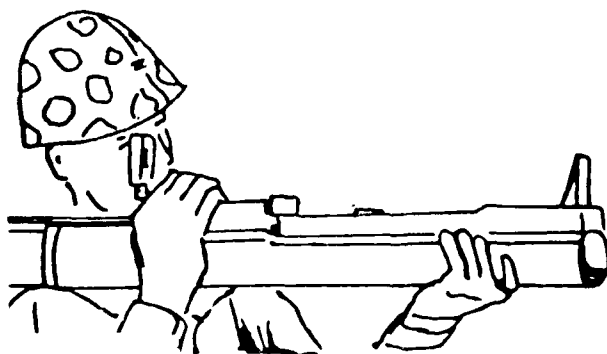
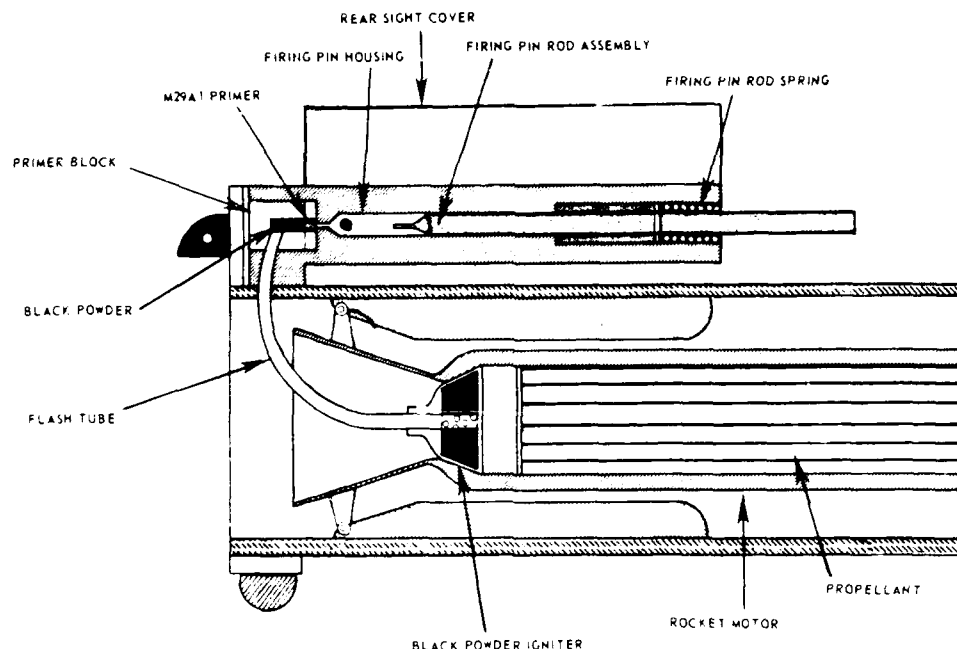


Figure 5-62.—Aiming launcher and depressing trigger bar.



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Figure 5-63.—Functioning of ignition system.

MALFUNCTIONS

The most common malfunctions that occur with the LAW are the misfire or hangfire.

1. *Misfire.* A misfire is a complete failure to fire, which may be caused by a faulty firing mechanism or a faulty element in the propelling charge explosive train. A misfire, although not dangerous, cannot be immediately distinguished from a delay in the functioning of the firing mechanism or from a hangfire, therefore, it should be considered a delay in firing until such a possibility has been eliminated.

2. *Hangfire.* A hangfire is a delay in functioning of the propelling charge explosive train at the time of firing. The amount of delay, although unpredictable, in most cases will range between a split second and several minutes. Therefore, a hangfire cannot be immediately distinguished from a misfire.

IMMEDIATE ACTION

After a weapon fails to fire and while the launcher is still positioned on your shoulder,

resqueeze the trigger. If the weapon still does not fire, wait 10 seconds and proceed as follows:

1. Keeping the launcher aimed at the target, place the trigger safety handle in the SAFE position and remove the launcher from your shoulder.
2. Wait one minute, depress the detent, and collapse the launcher approximately 4 inches.
3. Grasp the rear sight cover and re-extend the launcher. (The launcher is automatically cocked when re-extended.)
4. Place the launcher on your shoulder, put the safety handle in the arm position, aim, and depress the trigger.
5. If the weapon still does not fire, wait 10 seconds before returning the trigger safety handle to the safe position.
6. Keep the weapon trained on the target area for at least 1 minute, but do not collapse the launcher.
7. Discard the launcher.

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MAINTENANCE

The LAW requires no preventive maintenance or repairs at the first or second echelon. No repair parts are supplied to the using organization.

DESTRUCTION

When capture of the LAW is imminent or if abandoning the system in a combat zone is necessary, the unit commander may order its destruction. Priority is given to the destruction of those parts most difficult to replace, such as the sight, firing mechanism, and launching tube. The same parts of the system should be destroyed to prevent the enemy from reconstructing one complete unit from several damaged ones. In combat, after the launcher has been fired, it should be destroyed to prevent the enemy from converting the launcher into a boobytrap.

Destruction can be accomplished by four methods:

- Burning
- Demolition
- Gunfire
- Crushing

INSPECTION BEFORE FIRING

Inspections are limited to visual checks of the sealed launcher unit. If any defects are observed, the weapon should not be used. In particular, **DO NOT FIRE THE LAW** if any of the defects listed below are observed.

- Seals not intact, particularly the rear cover gasket.
- Launcher tube cracked, punctured, crushed, or bulged.
- Rubber boots covering trigger bar and detent are torn, cracked, or punctured.
- Front or rear sight cover damaged.
- Sling assembly missing.
- Pull pin missing.
- Trigger safety handle not in place.

Again, if the launcher has any of these defects or discrepancies, **DO NOT FIRE THE WEAPON.**

FRONT SIGHT

The front sight reticle of the LAW contains an embossed, vertical range line with ranges from 50 to 350 meters in 25-meter increments. Two curved stadia lines are etched on the sight to aid the gunner in range estimation. On either side of the vertical range line are 15-mile-per-hour lead marks, which aid the gunner in tracking moving targets (fig. 5-64).

REAR SIGHT

The rear sight of the LAW is basically a simple peepsight consisting of a steel rear bar sight aperture plate attached to a spring that automatically compensates for temperature change.

AIMING

In general, to aim the launcher you must first estimate the range to the target with the stadia

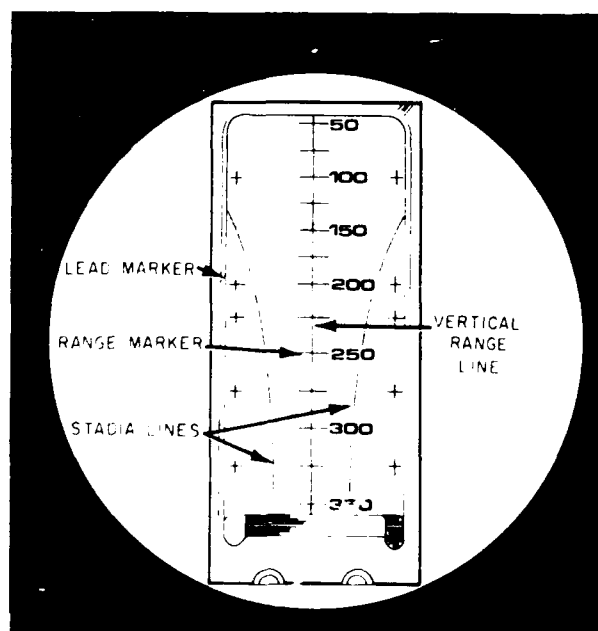


Figure 5-64.—Front sight reticle.

lines. Once the range is estimated, place the launcher back on your shoulder with your eye close to, and in line with, the rear sight peephole. Look through the peephole at the front sight reticle and place the target on the range line corresponding to the estimated range to the target.

Estimating Range with Stadia Lines

The stadia lines on the front sight are used to obtain an accurate estimation of the range to the target. The use of these lines is based on two generally true premises. First most tanks are approximately the same length. Second, most tanks are approximately twice as long as they are wide. Range may be estimated for a head-on (or tail-on) vehicle by placing the tank between the vertical range line of the sight and one of the stadia lines so that the vehicle just fits between these lines. The range is then read from the sight reticle. In figure 5-65, note that the tank just fits between the vertical line and the left stadia line at the 250-meter range line. For a tank moving at right angles (side view) to the launcher, place the vehicle between the right and left stadia lines and read the range. In figure 5-66 the tank just fits between the stadia lines at the 250-meter range line.

Engaging the Target

1. To engage a stationary target, the gunner estimates the range by using the stadia

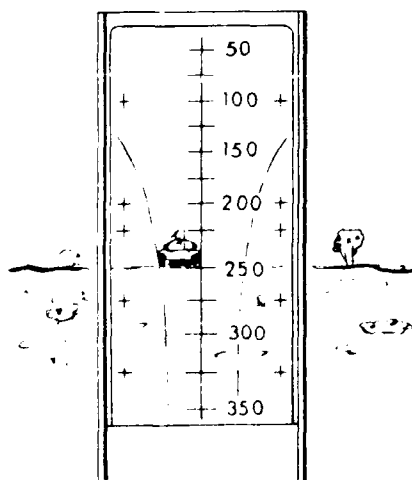


Figure 5-65.—Head on at 250 meters.

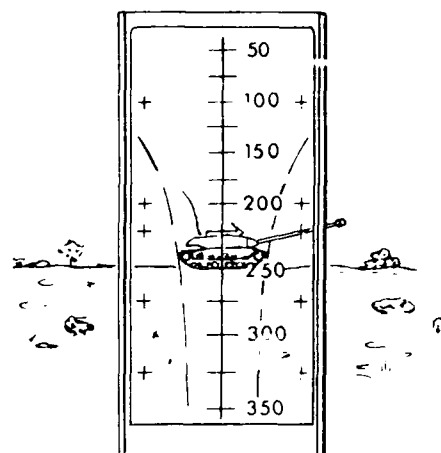


Figure 5-66.—Side view at 250 meters.

lines as described above. He then finds the range by using the stadia lines as described above. He then finds the range on the vertical range line and places that point on the target's center of mass (fig. 5-67).

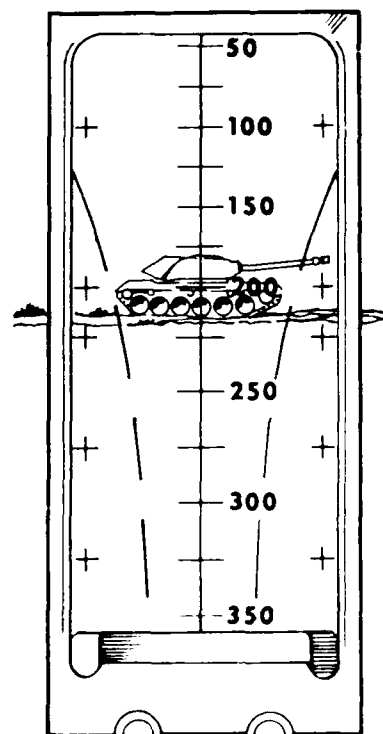


Figure 5-67.—Stationary target.

SEABEE COMBAT HANDBOOK

2. *Target moving directly toward or away from the gunner.* Use half a sight picture to obtain the estimated range (fig. 5-67). Locate this range on the vertical range line and place this point on the target center of mass.

3. *Targets moving directly across the gunner's front.* With a target moving perpendicular to the gunner's line of sight, the gunner must estimate the range to the target (fig. 5-66) and the speed at which the target is moving. The sight reticle should be placed on the target so that the vertical range line is always in *front* of the target's direction of travel. With the correct range marking lined up on the target, the launcher must be moved horizontally in the direction of the target's movement so that the lead marker (cross) opposite the range is lined up on the forward section of the target (fig. 5-68). With this line of aim, and the target moving at 15 mph at a distance less than 200 meters, the rocket should strike the rear third of the target. If the target is at a distance greater than 200 meters, the gunner should estimate additional lead. The lead marks on the sight reticle

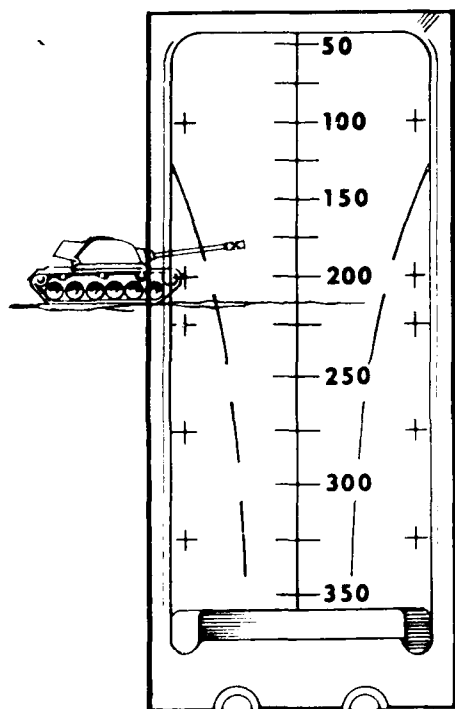


Figure 5-68.—Moving left to right 15 mph.

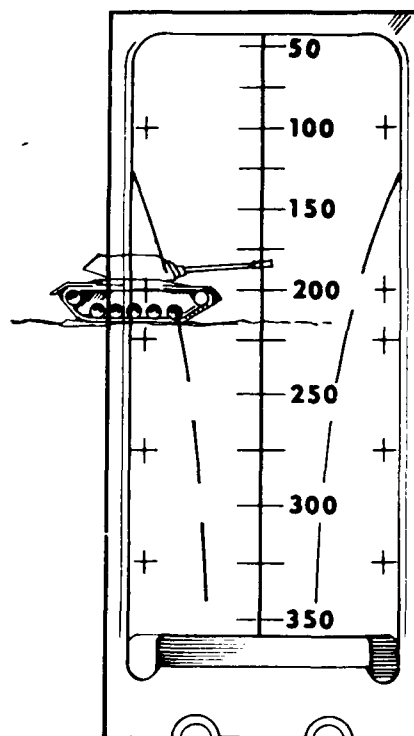


Figure 5-69.—Moving left to right 10 mph.

indicate 15 mph. If the gunner estimates the target's speed as less than 15 mph, he must adjust the amount of lead by visualizing a point on the reticle (fig. 5-69).

4. *Targets moving at an angle toward or away from the gunner.* When the target is moving toward the gunner at an angle where more of the front of the target is visible than the side, the gunner should estimate the range to the target and place the range on the forward edge of the target (fig. 5-70). If the target is moving at an angle where more of the side is visible than the front, the gunner should estimate the range, estimate the speed it appears to be moving, and apply one-half lead to the forward edge of the target (fig. 5-71).

TRIGGER SQUEEZE

The trigger is unique in that it is a bar located on the top of the launcher. To fire, you must

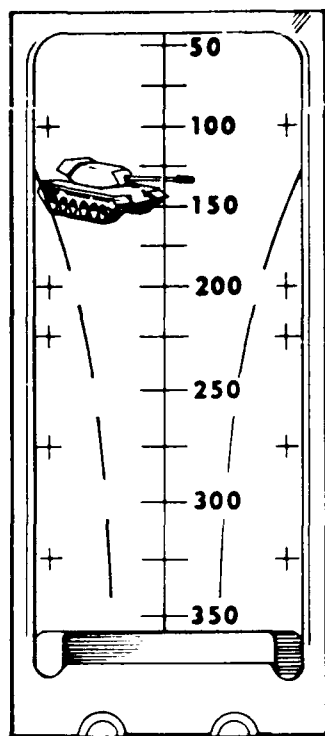


Figure 5-70.—Target moving toward gunner, 150 meters at an angle of 45° or less.

apply pressure straight down. The thumb may be placed under the launcher or alongside the tube depending upon the size of your hand and which position is more comfortable. You should apply a steady, smooth squeeze downward with your fingertips only.

FIRING POSITIONS

The LAW may be fired from the right or left shoulder in the standing, kneeling, modified kneeling, sitting, or prone position. The exact position may vary slightly to allow for the configuration of an individual's body. You must ensure that your position is stable and comfortable and that it is the most suitable one for you to engage the target. In general, the most suitable positions for you to engage a moving target are standing and modified kneeling. All of the positions are suitable for stationary targets. Situation, terrain, and gunner preference should govern the selection of the best position. A support stabilizes the gunner's aim if one can be used.

Standing Position

The standing position (fig. 5-72) is similar to that of firing a rifle. Face the target, execute a half-right face, spread your feet a comfortable distance apart, and place the launcher on your shoulder; your body should be well-balanced with the hips level. Your left hand should be directly under the forward portion of the launcher. Your right elbow should be placed against your body for stability. To traverse a moving target in this position, move your body from the ankles up.

Advantages—Freedom of movement for tracking targets.
Visibility.

Disadvantages—You are a good target.
Position is unstable.

Kneeling Position

The two satisfactory kneeling positions are shown in figure 5-72. The first one is preferable

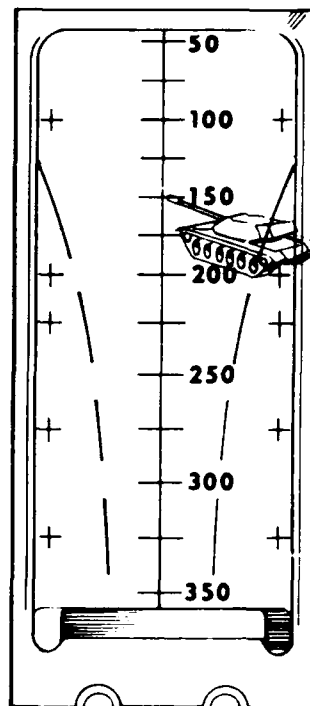


Figure 5-71.—Target moving away, 175 meters at an angle of 45°.

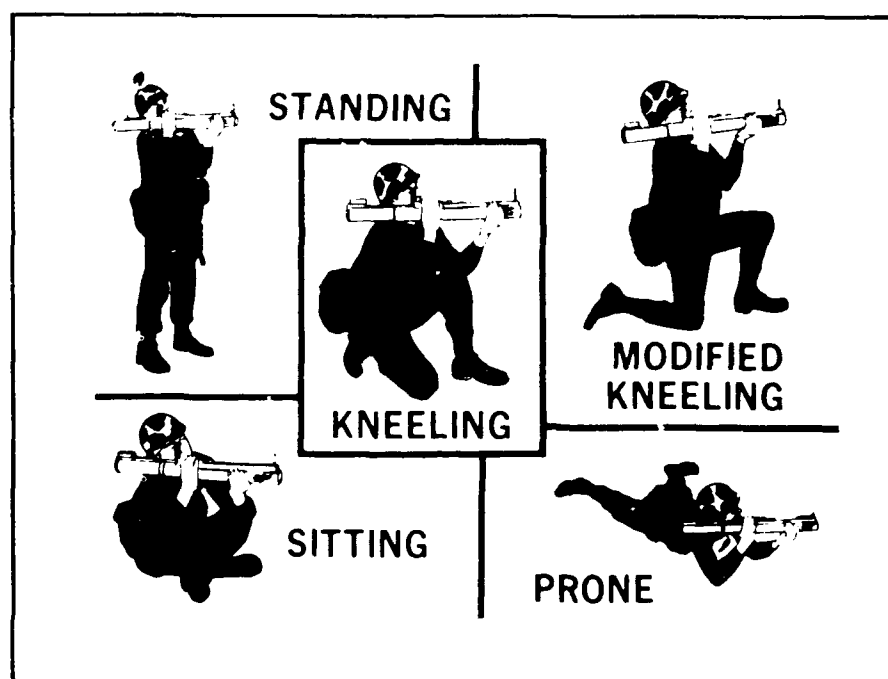


Figure 5-72.—Firing positions.

for tracking moving targets and is called the *modified kneeling position*. To assume the modified kneeling position, face the target, execute a half-right face, and kneel on the right knee with the upper part of the right leg in a vertical position. Point the left leg toward the target with the left foot at a right angle to and opposite the right knee. The left leg forms a right angle to the ground. Hold the body erect with the left elbow under the launcher and the right elbow against the side. To assume the second kneeling position, kneel on the right knee with the right thigh at a 90° angle with the line of aim; sit back on the right heel, shifting your weight forward. As viewed from the front, the left leg is in a vertical position. It does not appear vertical, however, when viewed from the side. Rest the upper left arm forward of the left knee and the right arm against the body. You may use either position when firing at stationary or moving targets.

Modified kneeling

Advantage—Freedom of movement for tracking.

Disadvantage—Unstable firing position.

Kneeling

Advantage—Stable firing position.

Disadvantage—Limited movement for tracking.

Sitting Position

Face the target, execute a half-right face, sit with legs crossed, lean slightly forward from the hips, and rest the elbows forward of the knees to avoid bone-to-bone contact (fig. 5-72). Place the right hand on the trigger and grasp the forward section of the tube with the left hand. You may also assume the position with legs apart and heels dug into the ground.

Advantages—Stable firing position.

You are a small target.

Disadvantages—Restricted movement.
Limited visibility.

Prone Position

To assume the prone position (fig. 5-72), lie down at an angle of not less than 45° to the line

of fire so that you will be clear of the backblast area (fig. 5-73). Your back should be straight and your right leg directly on an imaginary line running through the right hip and right shoulder. Move your left leg as far back as possible with comfort. Keep both heels on the ground. Hold both elbows well below the launcher. Hold your head as steady as possible with your right eye lined up with the sights. If an occasion that requires tracking a moving target should arise, maintain a 45° angle so that the backblast is not directed at your feet and legs.

Advantages—Very stable firing position.
You are a small target.

Disadvantages—Limited movement for tracking.
Limited elevation of the launcher.
Poor visibility.

GENERAL SAFETY PRECAUTIONS

The following precautions are necessary to prevent injury to personnel and damage to material:

1. Take care in selecting positions for firing. Avoid areas that will cause you to fire through

a screen of brush or trees. Impact with a twig or branch may deflect the rocket or cause it to detonate. You must try to obtain concealment, but not at the risk of safety.

2. To prevent the rocket from striking the foreground and causing serious injury to personnel, maintain the launcher in the firing position until the rocket has left the launcher.

3. Avoid the blast of flame and ejected residue to the rear of the launcher. Remove flammable material, such as dry vegetation, from the backblast area (fig. 5-73). Keep personnel and ammunition clear of the rear danger area unless adequate shelter protection is provided. Sand or loose dirt in the backblast area will also reveal your position to the enemy.

4. Do not fire rockets at temperatures below -40°F or above +140°F. (Some ammunition lots may have other temperature limits.) Temperature limits are marked on the launcher and are specified as safer operating temperature limits.

5. Do not fire a damaged weapon.

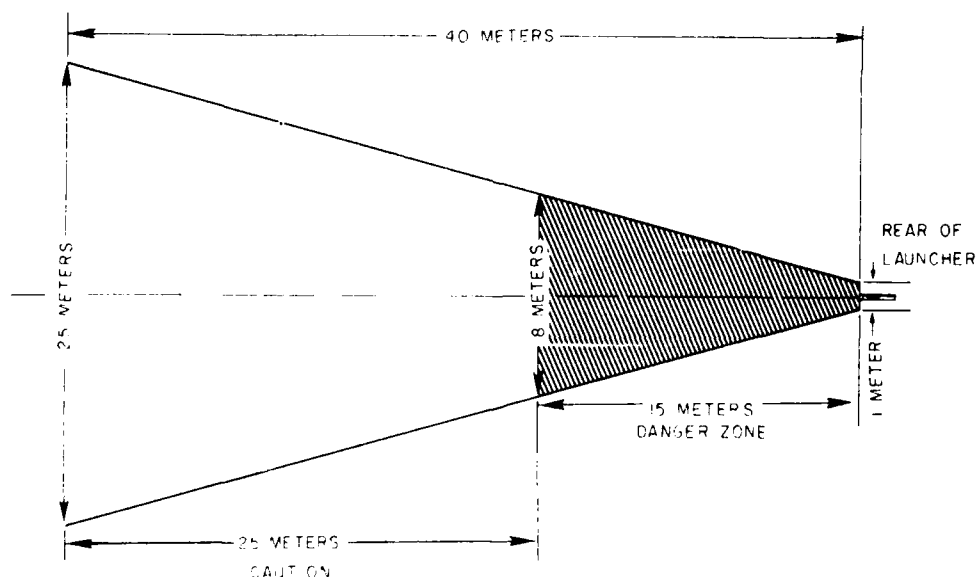


Figure 5-73.—Backblast area.

CHAPTER 6

ORGANIC SUPPORT WEAPON: 60-MM MORTAR

The mortar is perhaps the oldest type of firearm known to mankind, and its existence dates back as early as the fourteenth century. At that time, it was nothing more than a shallow steel pot filled with gunpowder and rocks that was aimed in the general direction of the target and fired by touching the powder with a red-hot iron rod. An important characteristic of this weapon is its high angle of fire, which enables it to be fired over obstacles, such as hills, forests, walls, or other defenses. As you can see, this is very important. The weapon will reach and destroy targets that are beyond the capabilities of flat trajectory weapons. The crew firing the 60-mm mortar is also protected from enemy observation and fire by these same obstacles.

The modern mortar has been developed into an extremely accurate and effective weapon with

the addition of an adjustable bipod and telescopic sight (fig. 6-1).

A variety of shells and fuzes have been developed to make the 60-mm mortar a versatile weapon. It can be used as either an offensive or a defensive weapon.

GENERAL DESCRIPTION AND DATA

The mortar is a smoothbore, muzzle-loaded, high-angle-of-fire weapon. It consists of a mortar barrel with a base plug and a firing pin. In the conventional mode the mount consists of a bipod with traversing and elevating mechanisms. A spring-type shock absorber absorbs the shock of recoil in firing. The baseplate is a unit that supports and aligns the mortar. For firing, the

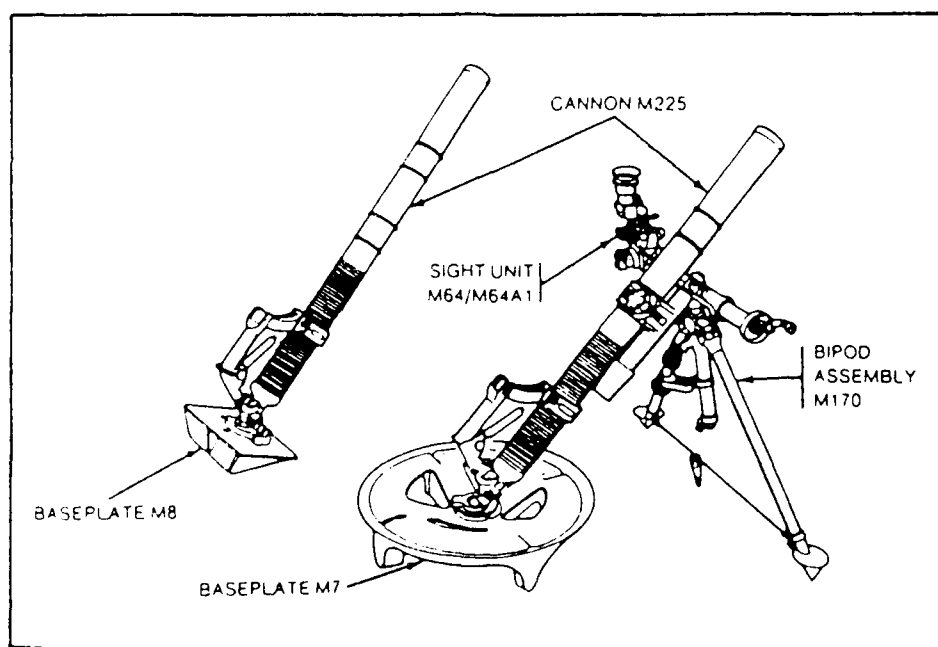


Figure 6-1.—60-mm lightweight mortar (M224).

base plug of the barrel is seated and locked into the baseplate with the barrel passing through the yoke of the bipod mount and secured to the shock absorber. For transporting, disassemble the mortar into three groups: barrel, bipod, and baseplate. This weapon may be transported by one crew member without disassembling it.

The mortar is fired by inserting a complete round into the muzzle, fin assembly down. The elevation of the barrel causes the round to slide toward the base of the barrel. On reaching the base, a propelling charge on the round is ignited by the firing pin. The pressure of the gas produced by the burning propelling charge drives the round up and out of the barrel. The fin assembly stabilizes the round in flight.

The mortar can deliver fire at ranges up to approximately 3,490 meters. The sustained and maximum rates of fire are related to the type of round and charge being used.

The complete mortar weighs 46.5 pounds in the conventional mode and 18 pounds in the hand-held mode. This includes the cannon (14.4 pounds), the bipod (15.2 pounds), the M7 baseplate (14.4 pounds), and the M8 baseplate (3.6 pounds). The overall length is 40 inches.

ASSEMBLIES AND COMPONENTS

The barrel assembly used with the 60-mm mortar is the M225 cannon (fig. 6-2). It consists of a barrel, fire selector, firing pin, trigger, and range indicator. The lower portion of the barrel is externally threaded. The external threads provide extra cooling surface and also help to strengthen the barrel. The base plug ends in a spherical projection that is flattened on two sides. The spherical projection fits into the locking cap of the M7 and M8 baseplates. The M224 has two firing modes: conventional and hand-held modes. Each mode requires different equipment and procedures.

CONVENTIONAL MODE

The **BIPOD ASSEMBLY** (fig. 6-3) consists of three major assemblies: the leg assembly, the elevating mechanism assembly, and the traversing mechanism assembly.

The **BASEPLATE ASSEMBLY** (fig. 6-4) is of one-piece construction and it supports and aligns the mortar for firing. The baseplate contains a rotating socket that holds the spherical projection of the barrel. The socket retaining ring holds the rotating socket in

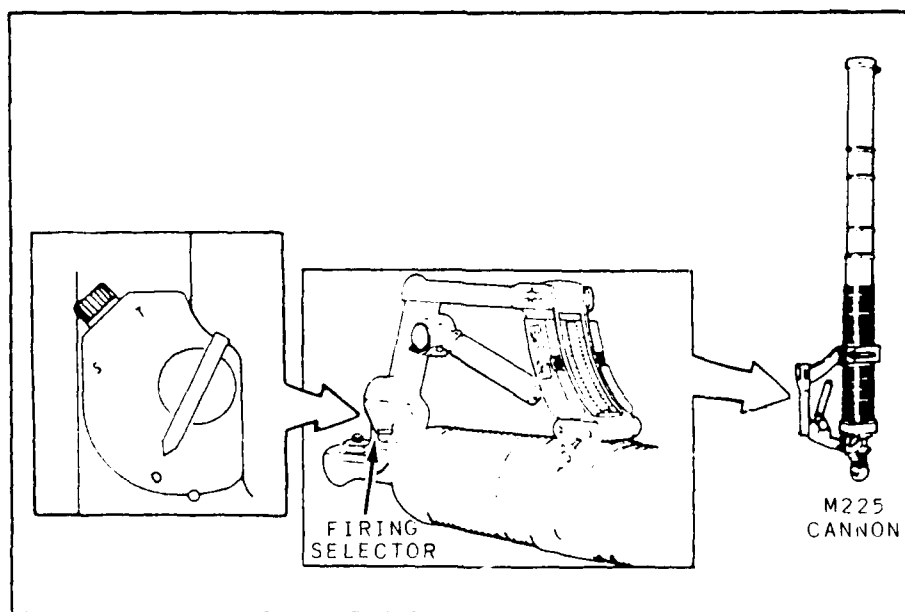


Figure 6-2.—M225 cannon.

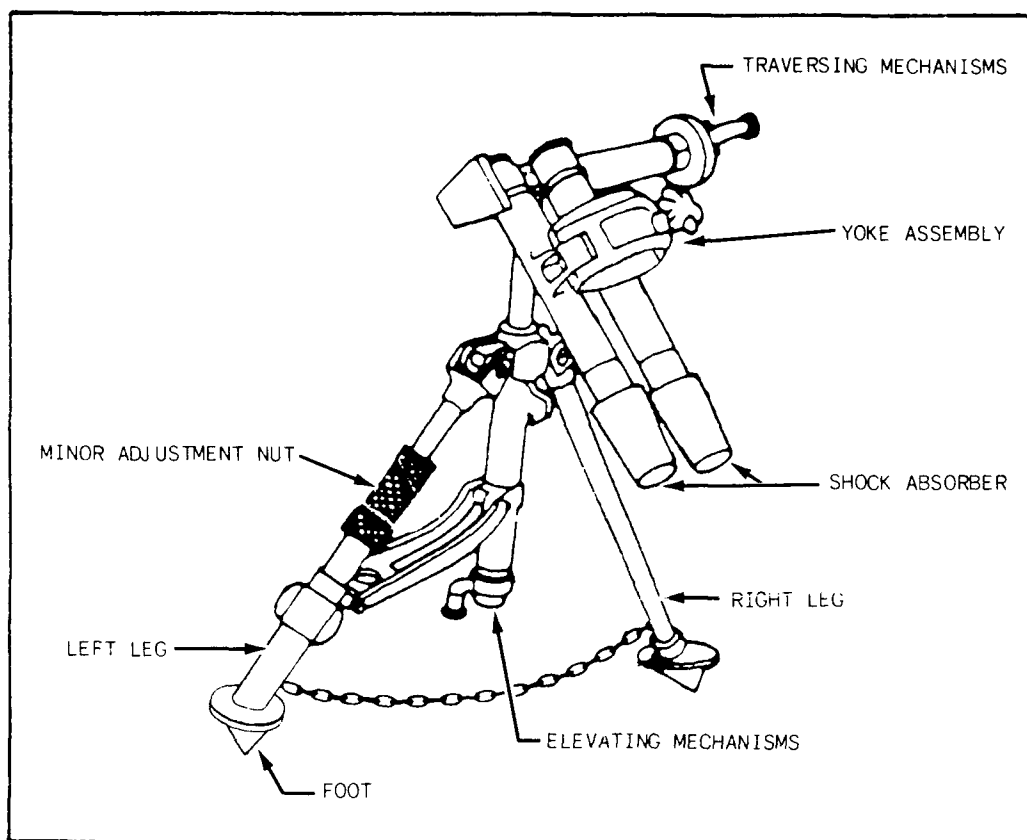


Figure 6-3.—Bipod assembly (M170).

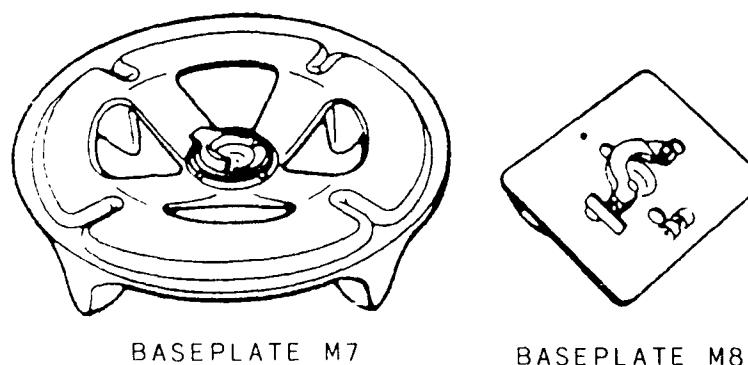


Figure 6-4.—Baseplates (M7 and M8).

place. The open end of the socket **MUST ALWAYS** point in the direction of fire. The bottom of the baseplate has reinforced ribs which hold the baseplate in position after it is seated in the ground.

In the conventional mode, the M7 baseplate, sight unit (M64/M64A1), and bipod are used. The

principle of this weapon is similar to the 81-mm mortar or any other mortar.

HAND-HELD MODE

The M225 cannon and M8 baseplate weigh approximately 18 pounds. This is a lightweight

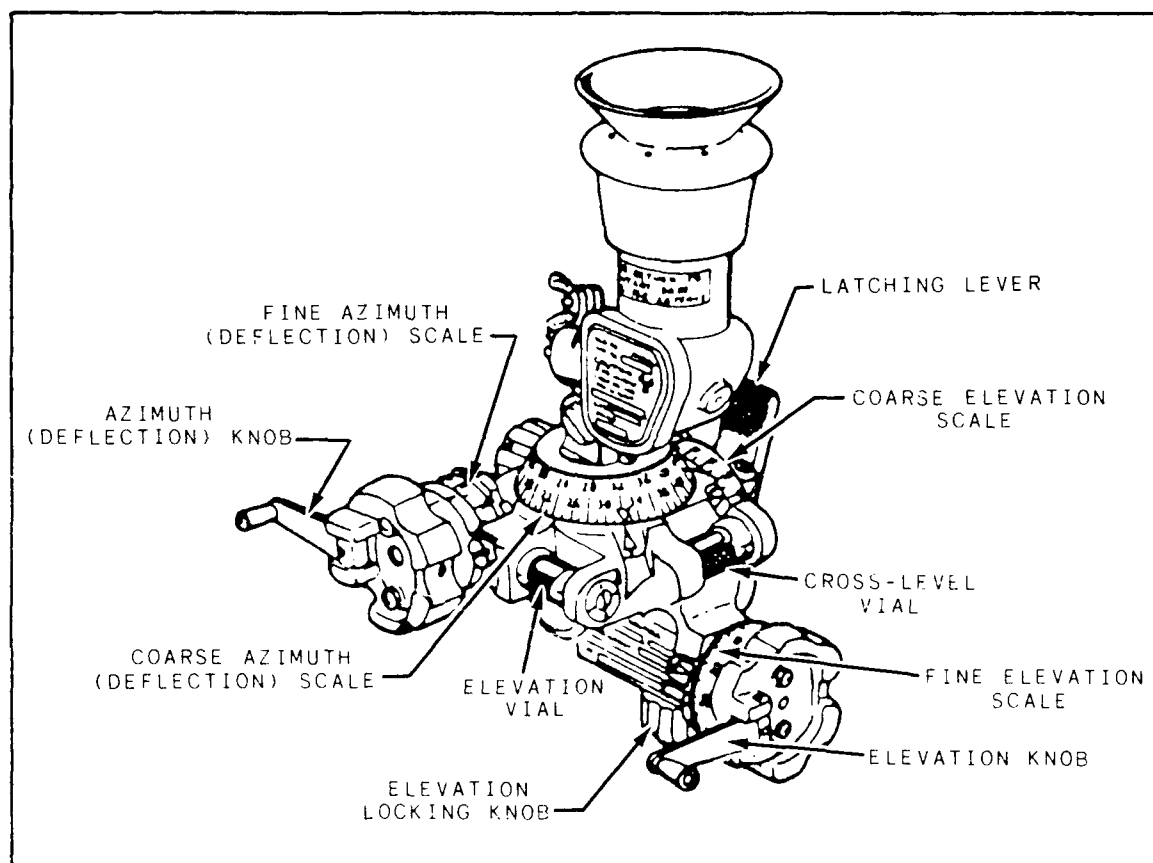


Figure 6-5.—Sight unit (M64/M64A1).

and highly mobile weapon that can be used in this mode on patrols with minimum deployment.

The **SIGHT UNIT (M64/M64A1)** (fig. 6-5) is the standard sight used with the 60-mm mortar. Once a sight has been calibrated on a mortar, it should always be used with that mortar. It is used for laying-in the mortar for elevation and deflection. The sight unit consists of a *telescope mount* and a nonmaintainable *elbow telescope*, fastened into one unit for operation. The elbow telescope provides magnification and a line of sight from which the mortar is aimed. The elbow telescope is a 1.5-power, fixed-focus telescope. The cross lines are at right angles to each other.

The telescope mount consists of the lower part, center part, and upperpart. The lower part contains a locking lever latch, an *elevation micrometer knob* with scale, and an *elevation locking knob*. There is also a *dovetail bracket* located on the right side of the mount that mates with the dovetail slot located on the *yoke* of the

bipod. A semicircular coarse elevation scale indicates from 700 to 1,600 mils in 100-mil increments.

The **ELEVATION KNOB** contains an elevation micrometer scale of 100 mils, numbered in 1-mil increments from 0 to 100. Turning the elevation knob tilts the mount in elevation to the desired angle, as read on the coarse and *micrometer elevation scale*. The *elevation locking knob* prevents the elevation knob from rotating during firing.

The center part of the telescope mount has a *deflection knob* that rotates the mount for direction. A crank is provided on the knob for rapid deflection movement. The *deflection locking knob* locks the deflection knob during firing. The *coarse deflection scale* is fixed to the upperparts of the center section and has 64 graduations. This scale rotates with the upperpart of the telescope mount. The micrometer deflection slip scale has 100 black graduations, numbered

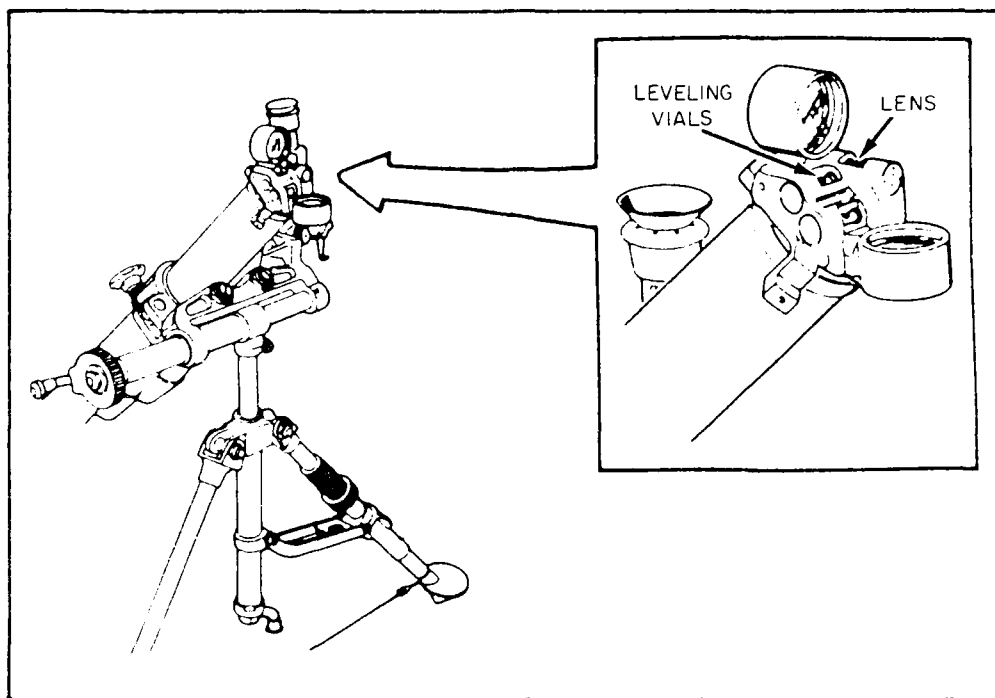


Figure 6-6.—Boresight (M115).

from 0 to 100 in increments of 1 mil. The M225 cannon, the M8 baseplate, and a heat protective mitten are all that is required to use this weapon in the hand-held mode. Laying-in and fire procedures are discussed later in this chapter.

The **BORESIGHT (M115)** (fig. 6-6) is used to calibrate the sight for the mortar. Since no two mortars are exactly alike, each sight **MUST** be calibrated on its own mortar. The body of the boresight contains three level vials. They are used to determine the angle of elevation (preset at 800 mils) and that the V-slides are in perpendicular position.

The **AIMING POST (M14)** is used with the mortar as an aiming point. Two aiming posts are provided for each mortar. When positioning the posts in hard or frozen earth, you should loosen the ground with an entrenching tool before trying to seat them. **DO NOT** attempt to hammer the aiming posts into the ground. This may bend the sections or burr the connections, making the posts unserviceable.

The **AIMING POST LIGHT (M58, GREEN AND M59, ORANGE)** is used for night firing by clamping the light to the aiming post. You can only see the glow of the aiming post light from the direction of the mortar position. The colored lights aid the gunners in identifying their own

aiming posts. More information regarding aiming posts, colored lights, and their uses is presented later in this chapter.

60-MM MORTAR AMMUNITION

Ammunition for the 60-mm mortar is issued in the form of "semifixed" complete cartridges (rounds). The term *semifixed* used in connection with ammunition signifies that the propelling charge is adjustable, and the round is loaded into the weapon as a unit. Except for the M69 training round, all 60-mm mortar rounds have three main assemblies: the fuze assembly, the body assembly, and the fin assembly (fig. 6-7). The M69 training round has no fuze assembly.

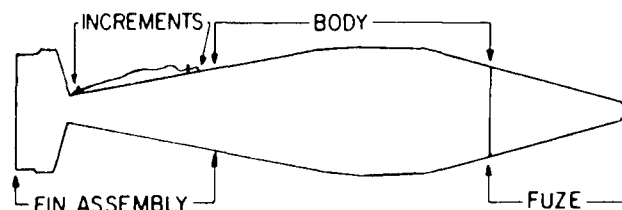


Figure 6-7.—A typical round of mortar ammunition.

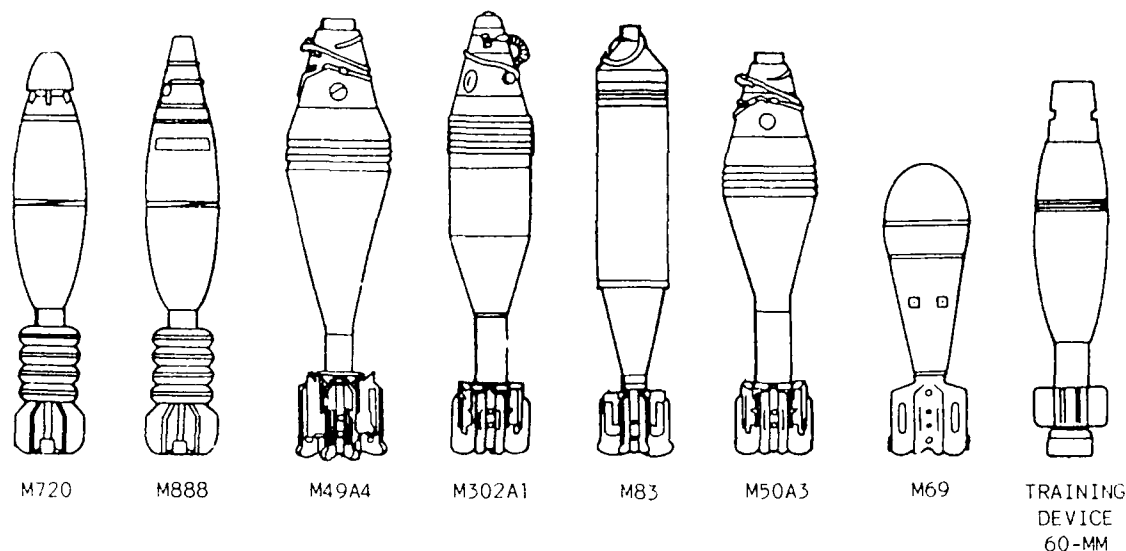


Figure 6-8.—Types of 60-mm mortar rounds.

The body is the main component of the round and contains the material (explosive charge, smoke, or illuminating charge) which produces the desired effect of the round. The fuze assembly controls the method of exploding the shell. The fin assembly stabilizes the round in flight and causes the round to strike with the fuze end first. A propelling charge is attached to or near the fin assembly of the projectile.

When the mortar round is fired, it carries all of its components with it, allowing the mortar to be ready to fire the next round. These rounds are shown in figure 6-8. The principle types of ammunition used in a mortar round are discussed in the topics that follow.

HIGH EXPLOSIVE (HE)

High-explosive ammunition is used to destroy or cause casualties to enemy personnel, emplacements, and vehicles. High-explosive ammunition causes damage by blast, fire, and fragmentation of the metal body.

SMOKE, WHITE PHOSPHORUS (WP)

White phosphorus ammunition is used for smoke screening, casualty-producing, incendiary (burning) action, and signaling. The WP rounds cause material damage by fire when the white phosphorus burns.

ILLUMINATING

Illuminating ammunition contains a flare attached to a parachute and is used for battlefield illumination and signaling.

TRAINING PRACTICE (TP)

This type of ammunition is used for target practice firing. The TP round is used for training mortar crews in the handling and firing of live ammunition. This round is similar to the high-explosive round, but it does not have a high-explosive filler in the body. It has only a small spotting charge to mark the point where the round hits the ground.

TRAINING

The training round is provided for training mortar crews in loading and firing the mortar. This round is completely inert and has no fuze. The propelling charge for the training round cannot be varied. This round is fired on training ranges at reduced distances. It is propelled only by an ignition cartridge up to a range of 275 meters.

IDENTIFICATION OF AMMUNITION

All mortar rounds are painted to prevent rust and to provide an easy means of identification.

CARTRIDGE	OLD COLOR CODE	NATO STANDARD CODE
High Explosive (HE)	OD w/yellow labeling	OD w/yellow labeling
Smoke (WP) (FS)	Gray w/yellow labeling	Light Green w/red labeling
Illuminating (ILLUM)	Gray w/white labeling	White w/black labeling
Practice (TP)	Blue w/white labeling	Blue w/white labeling
Training	Black	Blue w/white labeling

Figure 6-9.—Ammunition color codes.

The color of the body identifies the classification of the round according to tactical use. The information stenciled on the round gives detailed information concerning that particular round.

Color codes of ammunition have been modified by NATO agreement. Until ammunition manufactured before this agreement has been expended, the user must know both codes. The old and new codes are shown in figure 6-9. Along with the color codes, each round has the following information (fig. 6-10) stenciled on its body:

1. Caliber of mortar in which the round is to be fired (60 mm).

2. Types of filler (TNT, Comp B, Smoke WP, Illum).

3. Model of round (Cartridge or M888, M49A4, M302A1, M83, and so forth).

4. Ammunition lot number (AMM LOT PA-36-339). This is a number assigned to identify each group of rounds manufactured.

5. Warning label, if required. Some rounds have a warning label fixed on the body of the round. This warning label specifies the maximum propellant charge to be used when firing these rounds in the 60-mm mortar.

FUZES

The fuzes used on mortar rounds are designed to activate the fired round at the desired time or

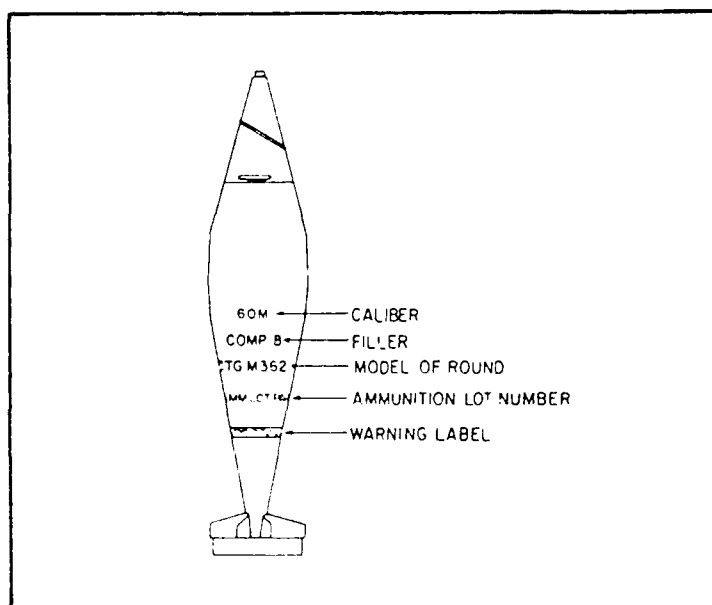
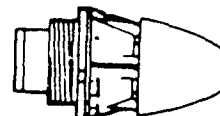


Figure 6-10.—Markings on rounds.

FUZES

Multi-option M734 Fuze

Functions: Prox/impact
 Settings: Prox, near surface burst, impact, or 0.05 second delay action.
 Remarks: Fuze is handsettable.



Point Detonating, M935 Fuze

Functions: Impact
 Settings: Superquick or 0.05 second delay action
 Remarks: Fuze has a safety wire



Point detonating, M525 and M527 Fuzes

Function: Impact
 Settings: None (superquick only)
 Remarks: Fuzes have bore-riding pins and safety wires.



Time, M65 Series Fuze

Function: Air burst
 Setting: None (Fixed time)
 Remarks: Fuze has a time train expelling charge and safety wire



M935 PD FUZE

- 1 Superquick setting
 - a. These fuzes are shipped pre-set to function superquick on impact.
 - b. Verify setting prior to firing. Selector slot should be aligned with SQ-mark on ogive.



SUPERQUICK SETTING

- 2 Delay setting
 - a. Turn selector slot in clockwise direction until slot is aligned with D-marking on ogive.
 - b. Use a flat tip screwdriver or bladed end of a M18 fuze wrench to change settings.



DELAY SETTING

Figure 6-11.—Fuzes.

place (fig. 6-11). There are three types of fuzes used with 60-mm mortar ammunition: impact, graduated time, and variable time. The IMPACT FUZE causes the round to function when it comes in contact with an object. Impact fuzes can be either point detonating (PD) or base detonating. Point-detonating fuzes that function immediately upon impact are called superquick (SQ). Point-detonating fuzes that have some penetration into the ground before functioning are called quick (Q). Point-detonating fuzes that enter the ground before functioning are known as delay (D). The GRADUATED TIME FUZES cause the round to function at a prescribed (set) time after the round is fired. Graduated time fuzes may function at the prescribed time only. These fuzes are known as time (T) fuzes. Graduated time fuzes may also have an impact element that causes the fuze to function on impact if it does not function at the set time. These fuzes are known as TIME and SUPERQUICK (TSQ) FUZES. The variable time fuzes have their own radio transmitter and receiver. They transmit a radio signal. This signal is reflected back to the fuze. As the fuze (round) approaches an object, the strength of the reflected signal increases. When the returning signal reaches a predetermined strength, the fuze explodes the round. These fuzes are known as proximity or VARIABLE TIME (VT) FUZES. The object that reflect the signal is not necessarily the target. It may be any object that can reflect the signal. The VT fuze explodes at a height of about 1 to 6 meters over normal terrain. However, the better reflecting surfaces cause the fuze to explode at higher altitudes and the poorer surfaces at a lower altitude. Trees also increase the height of the burst. Even clouds have caused the fuze to detonate.

MORTAR SQUAD EQUIPMENT

Each member of the mortar squad is responsible for certain equipment used in placing, firing, and maintaining the 60-mm mortar. Leaders must conduct frequent inspections to ensure that proper maintenance is available for this equipment.

Mortar Squad Leader. The squad leader is responsible for all equipment issued to his squad. In addition, he personally carries the following items: a pair of binoculars, a flashlight, and two baseplate stakes. The baseplate stakes, similar

to a surveyor's hub stake, are an optional item. If the squad does not have a communicator attached, the squad leader must also carry a radio or field telephone and wire.

Gunner (Crew Leader). The gunner is responsible for all equipment issued to his crew.

Assistant Gunner. The assistant gunner is responsible for loading the mortar. He also carries several rounds of ammunition in an assault vest.

Ammunition Bearer. He carries several rounds of ammunition in an assault vest.

POSITIONING THE MORTAR

In the conventional mode, the combat mission of the construction battalion and the mortar platoon is of a defensive nature. The mortars are set up within the camp or company defensive position as determined by the unit's commanding officer, in improved, permanent positions. The ammunition and equipment are kept nearby in a state of readiness. However, the unit commander does have authority to deploy these weapons in offensive missions and the following procedures relate to this type of deployment. By learning these simple procedures, a well-trained crew should be able to prepare a mortar for firing in approximately 1 minute.

Direct the initial fire of the mortar to the center of the target sector. The initial direction of fire is determined by the section leader, or given to them by the forward observer (FO) or the fire direction center (FDC). The section leader points out the mortar position and announces the direction of fire to the squad leader. The squad leader then places a baseplate stake where the baseplate is to be positioned. The squad leader then places a lensatic compass on the baseplate stake and rotates the compass until he can sight along the determined direction. He directs the ammo bearer to place a direction stake into the ground at least 25 meters from the baseplate stake, along their line of sight. After the direction stake has been placed, the number one ammunition bearer for the squad places the outer edge of the baseplate against the baseplate stake, so the left edge of the cutout portion of

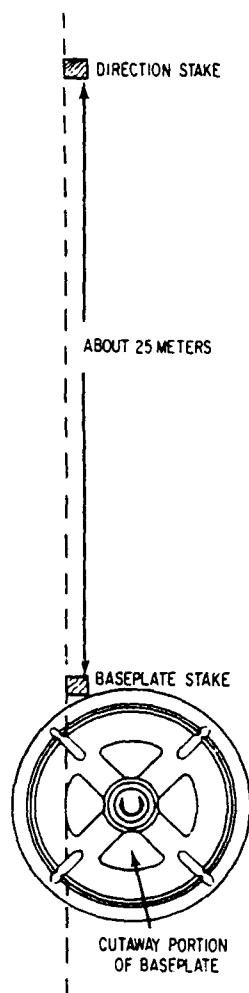


Figure 6-12.—Placing baseplate against baseplate stake.

the baseplate is aligned with the left edge of the stake (fig. 6-12).

PREPARATION FOR FIRING

Emplace the baseplate by standing on it and rocking back and forth. Rotate the locking cap until the opening in the cap points in the direction of the target. Place the base of the cannon into the cap opening. Rotate the cannon one-fourth turn, so the handle is in an upward position (fig. 6-13, views A and B).

Loosen the knob on the bipod, and swing it downward. Open the collar. There are two saddles on the M225 cannon for positioning the bipod. The upper saddle is used for elevations of

1,100 mils or less and the lower saddle for elevations greater than 1,100 mils. (The upper saddle must be used for boresighting this weapon.) Place the upper or lower saddle of the cannon into the collar of the bipod (fig. 6-13, view C). The handle and firing mechanism assemblies are straight-up on the top of the barrel. Close the collar and swing the knob into place and tighten. Hold the barrel in a vertical position, and pull the legs of the bipod up to unlatch and swing out (fig. 6-13, view D). Unfasten the hook and cable. Loosen the coarse cross-leveling nut and spread the legs. If the bipod is attached to the upper saddle, set the feet about 1 1/2 feet in front of the baseplate. If the bipod is attached to the lower saddle, set the feet about 1 foot in front of the baseplate. Press the bipod feet firmly into the ground (fig. 6-13, view E). With the coarse cross-leveling nut still loose, adjust the cross-leveling mechanism until the elevating mechanism is nearly vertical. Cross-leveling removes cant from the weapon. Hand tighten the nut. Adjust the fine cross-leveling nut clockwise to move the elevating mechanism to the left, or counterclockwise to move the elevating mechanism to the right, until it is vertical. Now, remove the sight unit (M64/M64A1) from its case. Press the latching lever while installing the sight unit on the bipod. Release the latching lever and check to see that the sight unit is firmly locked to the bipod. The gunner sets the deflection scale at 0 mils and the elevation at 1,100 mils. He then centers the elevation bubble and cross-levels the mortar. The mortar is now mounted and ready to be laid.

When more than one mortar is to be used for a mission, it is important that they be mounted and laid parallel. This helps to ensure proper target coverage and accurate destruction of a target when it is engaged.

LAYING A MORTAR USING THE COMPASS METHOD

Several methods are used to lay mortars parallel. The most rapid, but the least accurate, method is by using a compass. In this method the section leader stands approximately 6 feet behind the mortar and sights through the compass at a given direction. The section leader then directs the gunner to move the lay of the barrel left or right until the barrel and the sight wire of the compass are lined up. At this time the gunner rechecks to

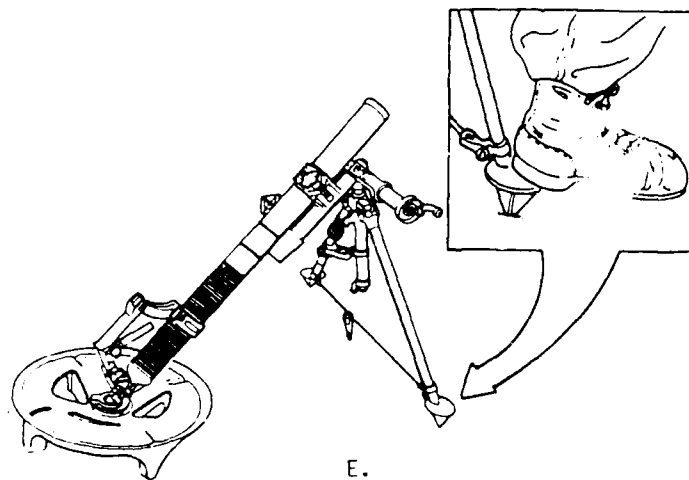
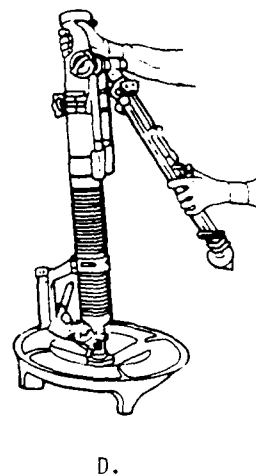
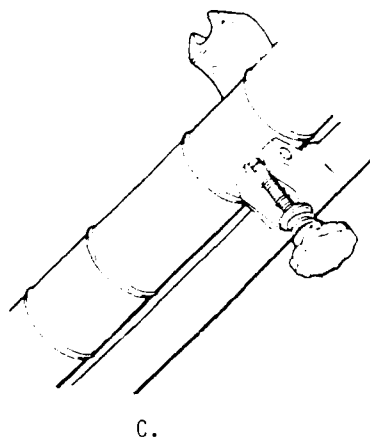
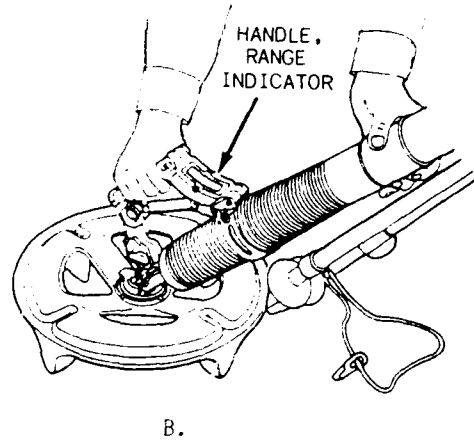
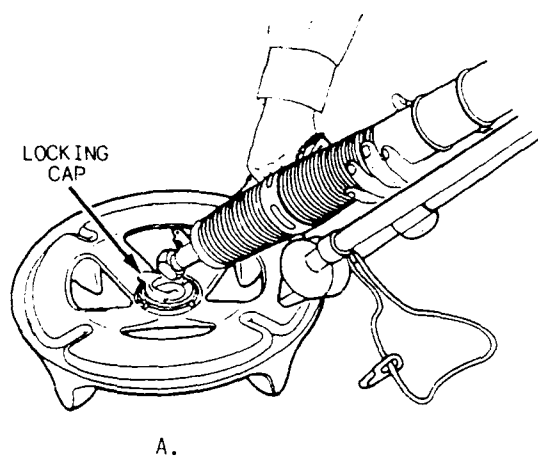
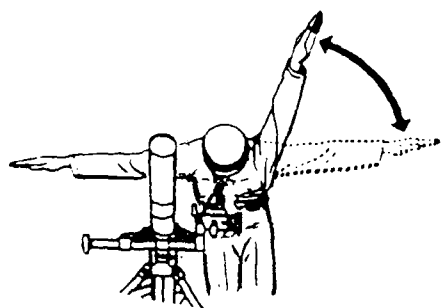
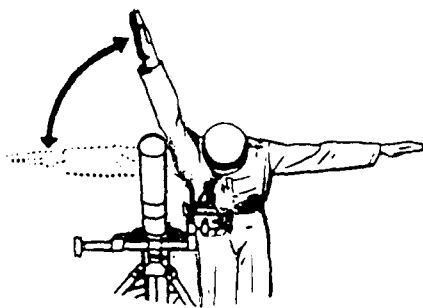


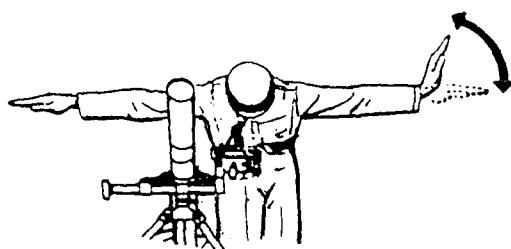
Figure 6-13.—Preparation for firing.



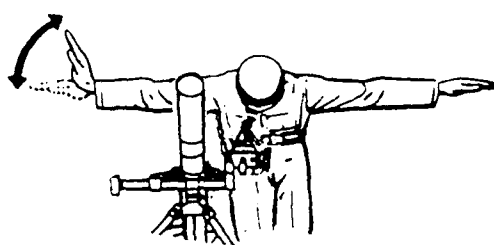
A. MOVE AIMING POST TO THE LEFT.



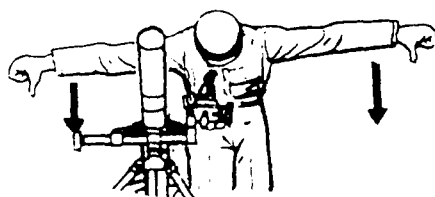
B. MOVE AIMING POST TO THE RIGHT.



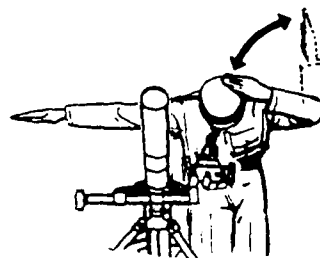
C. MINOR MOVEMENT OF THE POST TO THE LEFT.



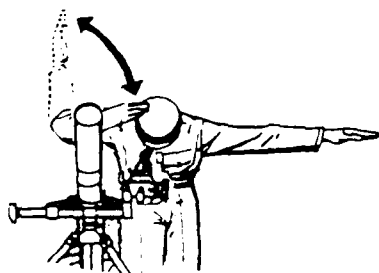
D. MINOR MOVEMENT OF THE POST TO THE RIGHT.



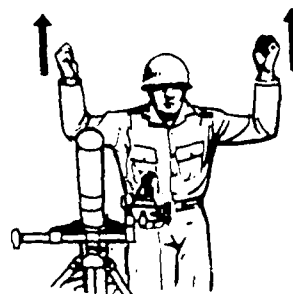
E. DRIVE IN POST



F. TILT POST TO THE LEFT.



G. TILT POST TO THE RIGHT.



H. POST CORRECT (MORTAR)

Figure 6-14.—Arm-and-hand signals used in placing out aiming posts.

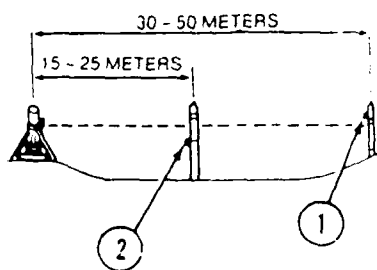
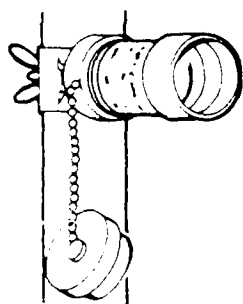


Figure 6-15.—Aiming post and lights (M58/M59).

see that all level vials are centered. When the center of the barrel and the sight of the compass are in line and all bubbles are level, the gun is laid. The section leader then directs the gunner to refer the sight and put out aiming posts. Referring the sight means making a deflection change on the sight without moving the mortar. To refer the sight, you turn the deflection knob until the given deflection is set on the sight. When using the M64/M64A1 sight, you can place the aiming posts where they can best be observed because the deflection scale can be slipped to read the desired deflection. The sight (M64/M64A1) is initially referred to a 0 mil reading, and the aiming posts are set on that deflection. The procedure for placing out aiming posts is discussed later in this chapter.

PLACING AIMING POSTS

Normally, two aiming posts are placed out to establish the aiming line. The rounds are fired from the mortar in reference to this line. After the mortar has been mounted and laid on the direction stake, the sight is normally referred to 2,800 mils, and the aiming posts are placed along this line of sight. The aiming posts are placed on the new line of sight by the ammunition bearer, observing the arm-and-hand signals (fig. 6-14) of the gunner. The posts are called the far post and the near post. The near post is placed out 15 to 25 meters from the mortar and the far post is placed at 30 to 50 meters (fig. 6-15). When this is not possible, because of terrain or situation, the post should be placed out as far as possible, keeping in mind that the distance between the two posts must be equal. The far post is always placed first and the near post last. When these two posts are seen through the sight, they will

appear as one. This is called the **ALIGNED** sight picture (fig. 6-16). If the two aiming posts do not appear as one, displacement of the sight or the baseplate has occurred. This separation is caused by one of two things: either (1) a large deflection shift that moves the entire sight out of the plane

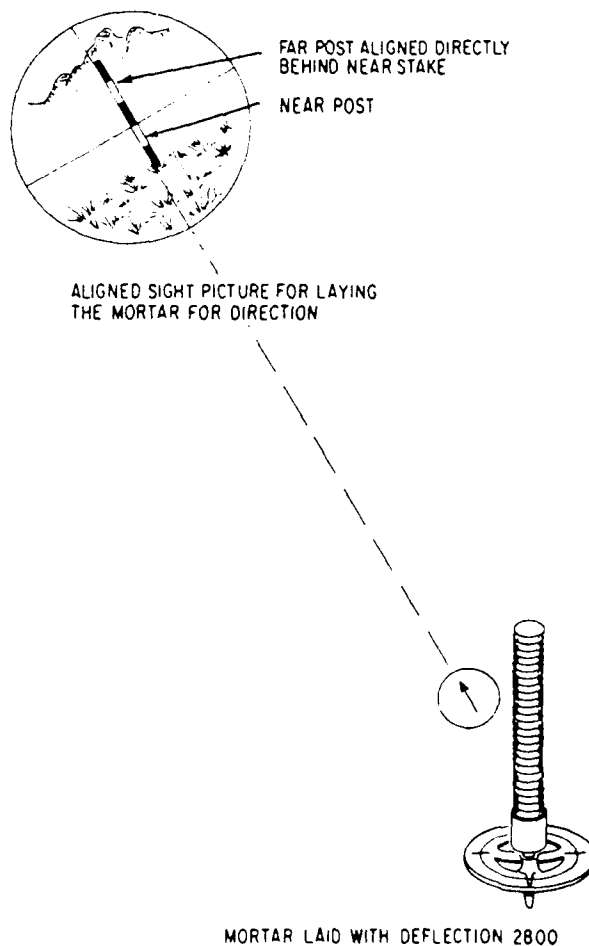


Figure 6-16.—Aligned sight picture.

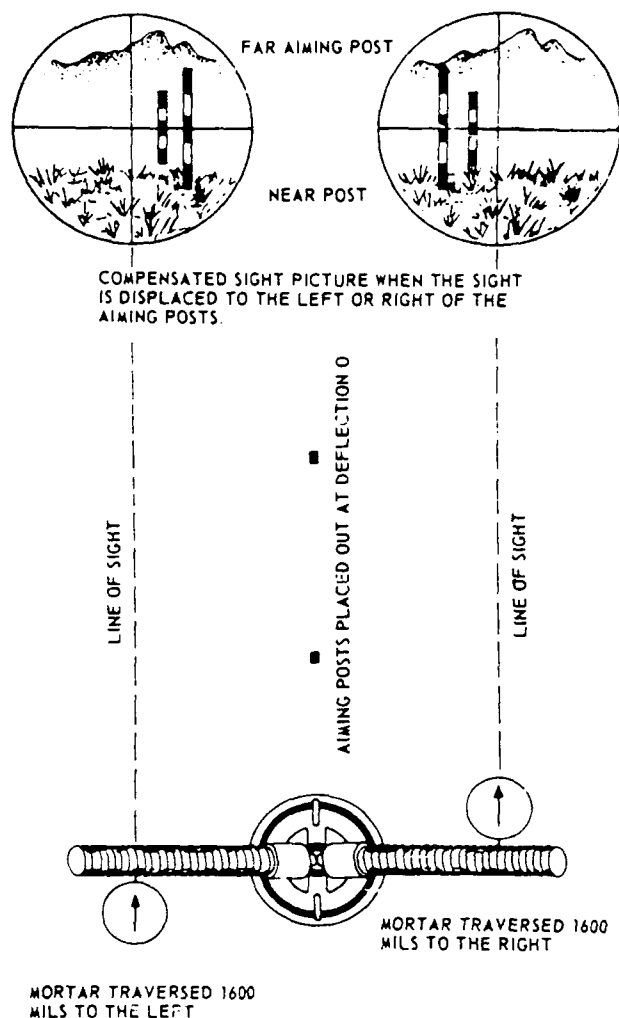


Figure 6-17.—Compensated sight picture.

passing through the aiming posts; or (2) a lateral (left or right) displacement of the baseplate caused by the shock of firing, which also moves the sight out of the plane of the aiming post. When both the far post and the near post are visible, it is called a **COMPENSATED** sight picture (fig. 6-17).

MASK CLEARANCE

Mask clearance is the clearance required for firing the weapon without danger of a premature detonation of the round by obstructions, such as trees, hills, or buildings. After the mortar is mounted, the gunner must determine the minimum and maximum mask clearance. This

determination helps to ensure troop safety at the mortar position and also helps the fire direction center (FDC) to know whether or not a particular mission can be completed with that mortar.

To determine mask clearance, the gunner sets the sight at 0 deflection and 0 elevation, making the line of sight parallel with the axis of the bore. The gunner then raises or lowers the barrel until the cross hairs of the sight just touch the obstruction (tree, hill, and so forth). The gunner then levels the elevation bubble by turning the elevation knob on the sight and reads the elevation from the elevation scale. This reading is the minimum (or maximum, depending on the obstruction's location) mask clearance. For a safety factor, 30 mils is added to (or subtracted from) the elevation reading.

Mask clearance must be determined in a complete circle around the mortar to every object that might interfere with firing. The gunner reports all these figures, stating the azimuth and clearance to the squad leader and FDC. He also keeps a record for himself.

In emergency situations, where time is extremely important, the gunner can quickly determine the mask clearance for any given target by placing his head near the base plug and sighting along the top of the barrel. If the line of sight clears the mask, it is safe to fire. Of course it would take considerable time to sight this way before every fire mission; therefore, at the first opportunity, determine the minimum and maximum clearance by using the sight and record it.

SIGHT PICTURE

The gunner can only have one of two sight pictures when the mortar is fired: either the **ALIGNED** sight picture or the **COMPENSATED** sight picture. To use the aligned sight picture correctly, the gunner must lay the vertical line of the sight reticle so it just touches the left side of the visible aiming post (fig. 6-16).

To use the compensated sight picture correctly, the gunner must lay the vertical line of the sight reticle so the left edge of the far aiming post is placed exactly midway between the left edge of the near aiming post and the vertical line of the sight reticle. This corrects for displacement of the sight (fig. 6-17).

SIGHTING

The gunner is responsible for setting the mortar to the correct deflection and elevation. Remember, when the gunner lays the mortar, the sight is first set for deflection then for elevation, while the mortar is first laid for elevation then deflection. You can readily remember this sequence by keeping in mind the key word *deed*.

1. Place Deflection on sight
2. Place Elevation on sight
3. Level for Elevation
4. Level for Deflection

For example, we will use the fire command for an HE round at a deflection of 2,700 mils, charge two, and an elevation of 1,150 mils. The mortar is already facing the principal direction of fire, and the sight is aligned with the aiming posts at a deflection of 2,800 mils.

SETTING THE SIGHT

The gunner first sets the new deflection of 2,700 mils on the sight unit. To do this, the gunner rotates the deflection knob counter-clockwise until the index points to 2,700 on the deflection scale and to zero on the micrometer scale. Notice that moving the knob counter-clockwise has moved the sight to the left. A clockwise movement would move the sight to the right.

The gunner should always keep in mind that the barrel moves in the opposite direction of the sight. In addition, the gunner must know in which direction the barrel is pointing after any given deflection change.

Any deflection command that would cause the barrel to be moved over 90 degrees either right or left of the principle direction of fire (PDF) is always given as a REAR deflection. (For example: DEFLECTION REAR TWO-SEVEN-HUNDRED.) Notice that a rear deflection is directly opposite the equivalent FRONT deflection. Any deflection without the command REAR is understood to be FRONT.

After rotating the sight to the new deflection of 2,700 mils, the gunner sets the new elevation by rotating the elevation knob until the index on the elevation scale points between 1,100 and 1,200, and the index of the elevation micrometer is pointed at 50 mils.

LAYING FOR DIRECTION

As the deflection placed on the sight is greater than 95 mils, it cannot be made by turning the traversing crank. Therefore, the gunner assisted by the assistant gunner must lay the barrel in the new direction of fire by moving the bipod. Whenever the bipod is moved in this manner, the gunner should always rotate the barrel to the center of the mechanism to give maximum flexibility at the new setting. As a rule of thumb, the bipod should always be moved whenever the new deflection is more than 20 mils either side of center. Care should be taken in moving the bipod to get roughly within two turns (20 mils) of the aiming posts to avoid excessive traversing.

With the barrel in its new position and the vertical cross hair aligned with the left edge of the aiming posts again, the gunner next levels the barrel for elevation by turning the elevating crank until the bubble of the elevation level is centered. The gunner then turns the adjusting nut of the cross-leveling assembly until the cross-level bubble is centered. After a final check with the aiming posts, the mortar is now laid in the new direction of fire and is ready for firing.

FIRE COMMANDS

Fire commands originate with the computer at the FDC or, when the mortars are used without an FDC, with the leader at the observation post. These commands contain the technical instructions that enable the gunners to lay the mortars for deflection and elevation.

It is often desirable to transmit fire commands in fragmentary form as the elements of the command are determined. When transmitted in this manner, the command can be executed while it is being issued. Whenever practical, fire commands are given orally. When it is not practical to give oral commands in person, telephone or radio may be used. The gunners repeat the elements of every fire command as they receive them. There are two types of fire commands: the initial fire command and the subsequent fire command.

NOTE: All fire commands, initial and subsequent, are repeated by the gunner.

The elements of both follow a definite sequence. However, subsequent commands include only

such elements as are changed, except that elevation is always announced.

INITIAL FIRE COMMAND

The initial fire command consists of the data necessary to fire the first round. There are eight elements of the initial fire command which are as follows:

1. MORTARS TO FOLLOW. (Alerts the firing element.)
2. SHELL AND FUZE. (Specific ammunition type and fuze to be used.)
3. MORTAR TO FIRE. (Designates the specific weapon or weapons to fire. Each weapon has a different number.)
4. METHOD OF FIRE. (Indicates the number of rounds to be fired and any special instructions.)
5. DEFLECTION. (The word *deflection* always precedes the sight setting. This element gives the exact deflection required to engage the target.)
6. CHARGE. (This element is announced by CHARGE and is followed by the desired number.)
7. TIME. (This element provides the fuze setting for the illuminating rounds. Omit this element for HE rounds.)
8. ELEVATION. (Elevation is given in mils preceded by ELEVATION. Elevation is the authority to fire except when the method of fire includes the statement AT MY COMMAND.)

SUBSEQUENT FIRE COMMAND

The subsequent fire command contains changes to the initial fire command data. Subsequent commands include only those elements that have changed except that elevation is ALWAYS announced, changed or not. Changes in direction are given in total deflection; for example, to change deflection from 2,700 to the left 50 mils, the leader would give a subsequent command of DEFLECTION TWO-SIX-FIVE-ZERO. When a change is made in mortars to fire or in the method of fire, the leader gives the subsequent command which includes both elements to avoid a misunderstanding.

ACTION

As soon as the gunner receives and repeats the command, he begins setting the designated

deflection and elevation on the sight unit. The number one ammo bearer, as soon as the gunner repeats the command, prepares the round for firing and hands it to the assistant gunner who does the actual loading. By the time the mortar is laid to the direction, the ammunition should be ready for loading.

PREPARING THE AMMUNITION

When the fire command is issued, the first ammunition bearer prepares the ammunition for firing.

Continuing with our example fire command, the gunner selects an M888 HE round. As this round is normally fuzed with the M734 fuze, the ammo bearer must first remove this fuze and replace it with the proximity fuze as designated in the fire command. To do this, he removes the fuze with the M18 fuze wrench. He then takes the proximity fuze from its container and inspects the threads to ensure that they are in good condition. The fuze is then inserted into the fuze cavity of the projectile and manually screwed in by grasping the base of the fuze. Using the fuze wrench, he tightens the fuze until no clearance exists between it and the body of the projectile.

With the new fuze installed, the ammo bearer next adjusts the propellant charge. The fire command called for a CHARGE TWO. As the M888 HE round is issued with a total of four propellant increments, he knows he must remove two of these.

After the round is prepared for firing, do NOT try to change the fuze. The ammo bearer removes the safety (cutter) pin and passes it to the assistant gunner who does the loading.

LOADING AND FIRING

In the drop-fire method (conventional mode), as soon as the gunner ensures that the mortar is laid correctly, he removes the sight unit and sets the firing selector to the D (drop) position. This is done for the first three rounds or until the baseplate is settled, at which time the sight may stay on the mortar while firing.

The gunner kneels on the left side of the cannon and looks into the sight unit. The assistant gunner kneels on the right side in front of the traversing mechanism facing rearward. The ammunition handler kneels beside the assistant gunner slightly to the rear (fig. 6-18).

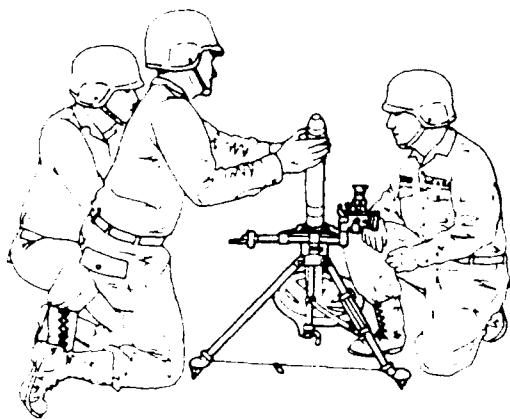


Figure 6-18.—Firing position: Conventional mode.

The ammunition handler adjusts the propellant charge for the desired range, sets the fuze for the desired burst effect, removes the safety wire/pin, and hands it to the assistant gunner. As the example fire command stated earlier, the method of fire is **ONE ROUND AT MY COMMAND**; the gunner cannot fire until given the command. When the gun is ready to fire, the gunner notifies the FDC or squad leader that the gun is **UP**. The gunner then kneels in an upright position. The next command that the gunner receives is **HALF LOAD**. As the gunner repeats the command, the assistant gunner grasps the body of the round with two hands near the center of the round. He inserts it, fuze end up, into the muzzle beyond the narrow part of the body.

WARNING: If a crew member is within one meter of the muzzle during firing, hearing protection must be used.

At the command to **FIRE**, the assistant gunner releases the round, passes his hands partly down the outside surface of the barrel while pivoting

to his left and bending toward the ammunition handler.

If the firing selector is set at the **T** (trigger) position, the gunner squeezes the trigger after the round hits bottom, on the command to **FIRE**.

The hand-held mode (fig. 6-19) requires no sight unit. The range indicator assembly is used to estimate target range. Use of the range indicator is for M720/M888 cartridges only. As the gunner kneels directly behind the barrel, he places a glove on his left hand to hold the barrel. Next, he puts his right hand on the trigger/handle and points the mortar toward the target. At this time, the gunner reads the range indicator.

The range indicator (fig. 6-20) consists of a vial which contains a ball that moves when the

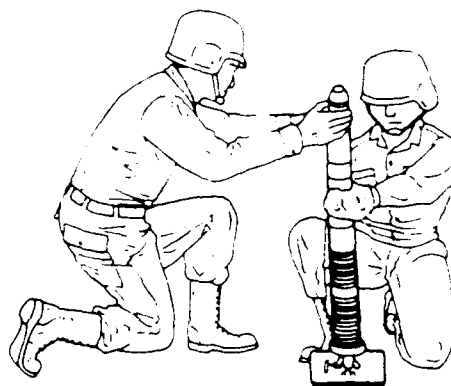


Figure 6-19.—Firing position. Hand-held mode.

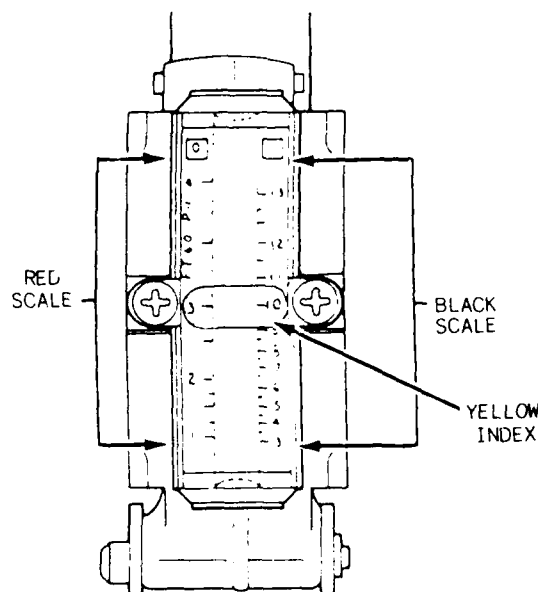


Figure 6-20.—Range indicator.

cannon is elevated or depressed to indicate the firing range.

The black scale is for charge one; the red scale is for charge zero. The yellow index (range 3 on the red scale and range 10 on the black scale) is a warning reminder to brace the baseplate before firing.

The ammunition handler prepares the cartridge. As the gunner sets the firing selector in the T (trigger) position, the assistant gunner inserts the round into the muzzle, releases the round, and assumes a safe position. The gunner lays-in the weapon by using the range indicator and sighting over or on the side of the muzzle for the azimuth. Holding the mortar steady, the gunner assumes a safe firing position. When the weapon is on target, the gunner squeezes the trigger to fire, then releases the trigger in preparation for the next round.

MISFIRES

A MISFIRE is a round that has been inserted in the mortar but has failed to fire. A misfire is a complete failure to fire. It may be caused by a faulty firing mechanism or a faulty element in the propelling charge explosive train. A misfire in itself is not dangerous, but since it cannot be immediately distinguished from a delay in functioning of the firing mechanism or from a hangfire, it must be handled with care. Mechanical malfunctions may be caused by a faulty firing pin, rounds loading in the barrel because of burrs, excess paint, oversize rounds, or foreign matter in the tube.

A HANGFIRE is a round that gets lodged in the barrel for one reason or another, and the round does not strike the firing pin. Thus, a hangfire cannot be distinguished immediately from a misfire. Any round that fails to fire should be treated as a misfire. When a firing malfunction occurs, any member of the squad noticing that a misfire has occurred immediately announces MISFIRE. When conditions permit, the mortar crew should wait approximately 1 minute before attempting to clear the misfire. This waiting period may avoid an accident caused by a delayed action of the ignition cartridge. If the barrel is excessively hot, it should be cooled to avoid cooking off the misfire. Wet sandbags or water or both may be used to cool the mortar barrel. All persons not actively engaged in clearing the misfire should be kept at a safe distance until the misfire has been removed.

The above procedures are similar for both the conventional mode and the hand-held mode. The major difference is the support needed for the M225 cannon, since the hand-held mode is without a bipod. Sandbags, empty ammo boxes, or anything else that will furnish the required support may be used to maintain safe elevation of the muzzle.

If a misfire occurs, the gunner sets the fire selector to the T (trigger) position and squeezes the trigger twice to confirm the malfunction. If the weapon fails to fire after the second try, any crew member noticing it announces MISFIRE. The gunner changes the firing selector to the S (safe) position, and then kicks the lower portion of the cannon (fig. 6-21). This is to dislodge the round. The gunner ensures the weapon is aimed down range, changes the fire selector to T (trigger) position, then squeezes the trigger. The round should fire. If it does not, he returns the selector to the S (safe) position and keeps the muzzle elevated and pointed down range. He then allows the outer surface to cool. This can be done by using water (fig. 6-22) or just allowing the air to cool it until the cannon can be handled with bare hands. The gunner lifts the base cap end (fig. 6-23) of the cannon, and the assistant gunner places his hands around the outer edge of the muzzle. As the base cap end is lifted, the round should slide out. The assistant gunner stops it with his thumbs, then removes the round from the bore and places it in the designated area.

CAUTION: Never put your hands in front of the muzzle.

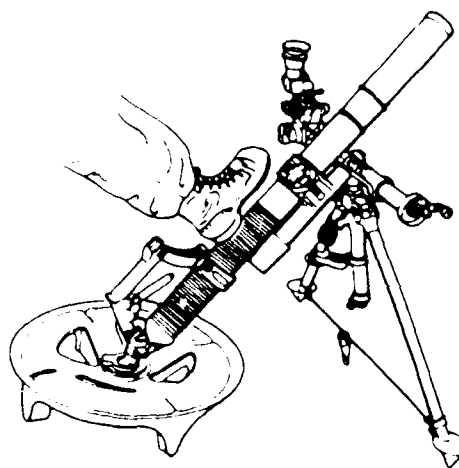


Figure 6-21.—Misfire procedure: Dislodging the round.

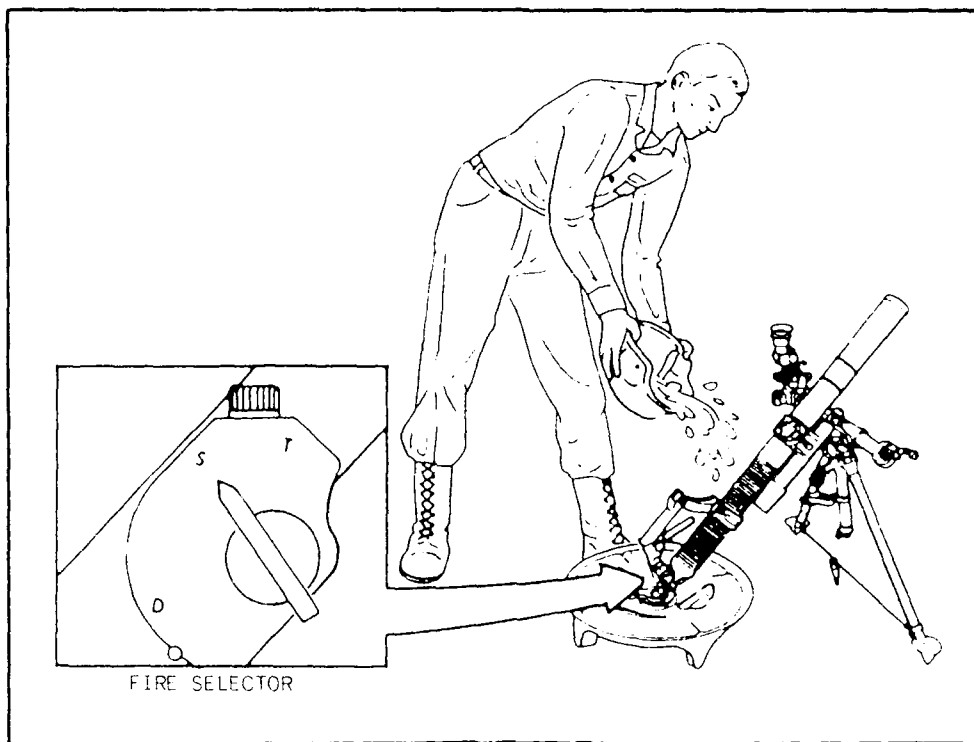


Figure 6-22.—Misfire procedure: Cooling the barrel.

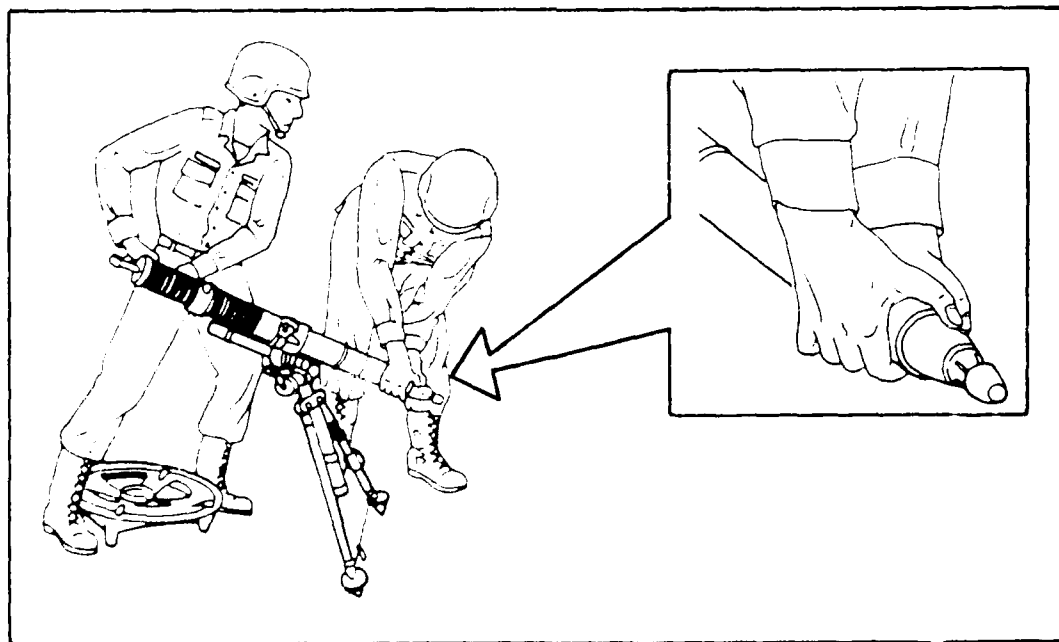


Figure 6-23.—Misfire procedure: Removing the round.

CARE AND CLEANING

The mortar squad members are responsible for the care and cleaning of the gun. Basically, each member is responsible for the part of the gun that he carries.

A schedule should allow time for supervised cleaning on each day the mortar is fired and once weekly when it is not in use.

GENERAL CLEANING

To clean the bore, attach cotton waste or rags to the cleaning staff and insert them into the bore. Move the staff in and out several times with a turning motion. Replace the dirty rags with clean rags. This cleaning removes the accumulation of dust, dirt, and thickened oil. Repeat this procedure until the rag comes out clean. When necessary, wash the outside of the barrel with a soap solution, rinse it with clean water, dry it, and apply a light coat of preservative lubricating oil. You must be careful to thoroughly rinse and dry all parts of the mortar after using soap and water.

CAUTION: When cleaning the bore, be careful not to leave any waste on the firing pin.

To clean the firing pin, remove it by using an Allen wrench. Insert the firing pin vent cleaning brush into the vent. While exerting a light pressure, turn the brush clockwise to remove any excess foreign material from the shoulders of the vent. Clean the shoulders carefully, because the firing pin doesn't seat correctly when there is any foreign material left on the shoulder. This results in gas leakage while firing. Next, wrap a rag around the vent cleaning brush and insert it into the firing pin vent. Clean the vent by moving the rag back and forth through it. Replace the dirty rag and repeat this procedure until the rag comes out clean; then, saturate the clean rag with preservative lubricating oil, and push it in and out of the vent. Next, clean the firing pin, oil it lightly, and properly reseal it into the base plug.

To clean the mount, keep all parts of the bipod and baseplate clean and free of foreign matter. Keep all moving parts and polished surfaces lightly coated with oil. Use a small paintbrush or toothbrush to clean the screw threads and crevices. To remove moisture and dirt from the metal surfaces, rub them with a dry cloth; then wipe them with a cloth containing a small quantity of preservative lubricating oil. Maintain this

protective film at all times. Clean and lightly oil the socket, socket cap, and collar of the baseplate.

CLEANING BEFORE FIRING

Before firing, the mortar crews should complete the following actions:

1. Inspect the three units of the mortar for cleanliness.
2. Clean the bore and firing pin with clean, dry rags. Do not apply oil to these parts before firing.
3. Do not leave any waste on the firing pin or in the barrel. Do not use grease.
4. Clean thoroughly and oil lightly all metal moving parts with preservative lubricating oil.

CLEANING AFTER FIRING

Clean the bore and all working parts of the mortar immediately after you complete firing. If cleaning cannot be accomplished immediately, apply oil to prevent corrosion. At the first opportunity, clean, oil, and inspect the mortar. If necessary, have repairs and replacement made by the unit armorer.

Clean the bore with rifle-bore cleaner immediately after you complete firing and 3 consecutive days thereafter (a minimum of four cleanings). The barrel should be cool enough to touch with the bare hand before you use bore cleaner on it. The cleaner evaporates at 150°F, and such evaporation causes dark spots on the barrel. When rifle-bore cleaner is not available, use a hot soapy solution or plain hot water. Clean the vent and firing pin, as described previously, using a liberal quantity of a soapy solution instead of rifle-bore cleaner. Dry the parts by using clean rags and applying preservative lubricating oil. When cleaning the mount, take care to remove dirt from all crevices. Clean all moving parts with rifle-bore cleaner, dry them, and apply preservative lubricating oil to all surfaces. To distribute the oil over the working surfaces, operate the traversing and elevating cranks. Clean the socket on the baseplate, as previously discussed.

FORWARD OBSERVER

The forward observer (FO), as the "eyes" of the indirect-fire team, has the primary mission of locating suitable targets and calling for and

adjusting fire on these targets. He also has the mission of collecting intelligence information that can be derived from surveillance of his area of responsibility. Such information is reported through channels to higher headquarters.

To accomplish his primary mission, the FO must select an observation post (OP) from which he can obtain maximum observation of his area of responsibility and still have the necessary cover and concealment. (It is also desirable that the approach to the OP have more than one covered and concealed route so that the FO cannot be observed by the enemy as he moves in or out of this OP.)

The forward observer, working as part of the indirect-fire team, functions as an effective part of the team if he understands and applies the procedures and techniques discussed below.

TARGET-GRID METHOD OF ADJUSTMENT

Using the target-grid method of adjustment, a person who has a means of communication with either an infantry or artillery fire direction center and who can read an azimuth can adjust fire on any target he can see. From the forward observer's viewpoint, this method is much simpler than previous methods because he does not have to know the location of the guns and he does not have to compute as much data. It does not make any difference how far he is off the gun-target line because the fire direction center (FDC) makes adjustments to keep the burst on the observer-target line. To place fire on the target, the forward observer follows three simple steps:

1. He establishes communication with the FDC.
2. He attempts to locate the target for the FDC.
3. If the initial round or rounds miss the target, he sends corrections to the FDC that will cause subsequent rounds to hit the target.

A trained FO or a communications expert is not necessary to observe and adjust fire for mortars. However, it helps to know communication procedures and the method of conducting fire explained in this chapter.

The target-grid method of adjustment has the following advantages:

1. The FO enjoys freedom of movement on the battlefield since he is not concerned with the

location of the mortar and the mortar-target line. This enables him to accompany the unit he is supporting, thereby giving it close and continuous fire support.

2. One forward observer can mass the fires of all mortar and artillery units within supporting range on a given target.

3. The combat SEABEE can fill any gaps in the forward observer's field of view, thus giving better indirect fire support to infantry units.

4. It simplifies the work of the forward observer and places the burden of computing on personnel of the FDC who can usually work under better conditions

5. It eliminates the necessity of training a large number of forward observers to compute correction factors and requires only relatively few trained computers at the FDC.

6. The system does not depend entirely on the accuracy of the forward observer's azimuth to the target. Errors as great as 100 mils can be made without having any appreciable effect on the adjustment. Larger errors throw the burst off the observer-target (OT) line; however, such errors are easily detected by the computer, and the correct azimuth can be quickly determined by connecting two on-line bursts on the plotting board and reading the azimuth of this line.

FORWARD OBSERVER PROCEDURES

When the FDC controls the fire of mortars emplaced in a section, any one of the three forward observers can be used to adjust fire for the unit. Each forward observer is accompanied by a radiotelephone operator who carries and operates a radio. The forward observer also carries a telephone and a reel of wire. When necessary, the mortar squad leaders supplement or relieve the forward observers.

Each FO is assigned to observe and conduct fire for a particular rifle unit in the company sector or zone of operation. He is also charged with maintaining contact with the supporting unit and keeping himself and the FDC completely informed of the tactical situation. His primary activity is to watch the movement of the supporting unit and to adjust mortar fire on those targets interfering with the mission of that unit. His secondary mission is to provide military information to higher echelons through his means of communication. He does this through

observing and correcting of prearranged fire and by adjusting fire on targets of opportunity that he observes or are identified to him by others.

The relative position of the OT line with respect to the mortar-target line does not affect the forward observer's procedure in adjusting observed fire. The forward observer makes his spottings and gives his corrections with respect to the OT line. He determines errors and sends corrections to the FDC. The FDC converts these corrections to appropriate fire commands. This is done by plotting the forward observer's corrections so the mortar section can place the next burst at the point designated by the observer. To assist in the reporting of targets, each FO may be given a freehand sketch or a suitable map showing the registration point and any other reference points whose chart locations are known at the FDC.

Terminology used by forward observers has been standardized throughout the Army, Navy, and Air Force. Therefore, the FO of a mortar section who is familiar with the basic principles of forward observation procedures is capable of adjusting the fire of any type of indirect-fire weapon. To adjust the fire of indirect weapons of units outside his own company, he establishes communication with the fire unit and maintains it throughout the adjustment.

LOCATION OF TARGET

The observer may report the location of a target for the FDC by one of three different methods: grid coordinates, shift from the reference point, and polar coordinates. These are listed in order of preferred use.

GRID COORDINATES. The forward observer may send the location of a target by grid coordinates, referring to a map or photomap. In this method, the forward observer sends an eight-digit coordinate that locates the target to the nearest 10 meters.

SHIFT. The forward observer reports the location of a target through a shift or change from a reference point, which may be the registration point, a marking round (to help identify the round, the observer may request a smoke round or airburst), a numbered target, or any other point whose chart location is known at the FDC. He

gives the shift as a correction in meters to the nearest 10 for deviation and 25 for range from the reference point. When either the direction or altitude of the target is the same as that of the reference point, he omits the correction. The forward observer determines the shift as follows:

1. **DEVIATION.** He measures the deviation in mils from the reference point to the target with binoculars and estimates the distance to the reference point. Then he determines the correction in meters from the reference point to the OT line by use of the mil relation formula or the deflection table and the observer-reference point distance. He includes this deviation correction in his call for fire.

2. **HEIGHT OF TARGET.** If the difference in altitude between the reference point and the target is 50 or greater, this correction is announced in the call for fire. The height of the target may be determined as follows: Measure the angle of site to the target and to the reference point; then, by the mil relation, compute the amount so that each is above or below the observation point. From these values, compute the correction for the difference in altitude of reference point and target.

3. **RANGE.** The forward observer estimates the distance along the OT line to the target from the reference point. This distance is the range correction and is included in his call for fire.

The shift method gives accurate results for shifts of 400 mils or less and acceptable results for shifts up to 600 mils. For greater shifts in direction, the deviation error and the difficulty of estimating the distance from the reference to the target increase rapidly. For this reason, the forward observer selects and adjusts on other reference points so the large shifts to any likely targets can be kept to a minimum.

POLAR COORDINATES. When the forward observer's location is known by the FDC, report the initial location of the target by polar coordinates. The FDC plots the target along the azimuth and at the range from the observer's location as reported by the observer. This method is particularly desirable in the case of large lateral shifts and short observing (OT) distances. If the observer's location is not known at the FDC, he may send it by grid coordinates or some other means.

CORRECTION BY THE FORWARD OBSERVER

In fire without an FDC, the forward observer makes corrections differently than when operating with a fire direction center. He makes all his deviation corrections with respect to the gun-target line rather than with respect to the observer-target line. All deviation corrections are sent to the mortar in mils or turns of the traversing handwheel.

Observer Within 100 Meters of the Mortar Position. The best location for the forward observer for rapid-fire adjustment is at the mortar position where his deviation spotting and deflection corrections in mils, to be placed on the mortar sight, are the same. The tactical employment of the mortar usually makes it necessary for the forward observer to be in a position other than at the mortar; however, if the forward observer is located within 100 meters of the mortar position, the deviation error that he reads in his binoculars can be applied directly to the sight without any computations. This is true because the angle that exists between the observer-burst line and observer-target line is, for all practical purposes, equal to the angle that exists between the mortar-burst and the gun-target lines. Any slight difference between these two angles is compensated for by the inherent dispersion of the weapon and the bursting area of the round. For example, if the observer, from a position within 100 meters of the mortar location, observes the burst to the left of the target and reads that it is 40 mils left on the mil scale of his binoculars, he orders a correction of RIGHT FOUR-ZERO.

The gunner applies this correction directly to the previous deflection setting, using the LARS (left add, right subtract) rule.

Observer More than 100 Meters From the Mortar Position. It is not always possible for the observer to be located within 100 meters of the mortar position. When he cannot locate himself within 100 meters of the mortar position, he must locate himself within 100 meters of the gun-target line. It can be readily seen that this might present some difficulty in visualizing the gun-target line and getting within 100 meters of it. If the observer is attacking targets over a wide frontage, he would be required to move frequently and his movement would be limited. In this situation, the angle that exists between the mortar-burst and the gun-target line is not equal to the angle that exists between the observer-burst and the observer-target line, and certain computations must be made to

correct the differences in these angles. For example, if the observer is halfway between the mortar and the target, the correction to be made on the sight is one-half his deviation spotting; if the mortar is halfway between the observer and the target, the correction is twice his deviation spotting. As other distances give other ratios, it is necessary to apply a correction factor to the number of mils spotted before ordering a deflection change. This factor is a fraction, the numerator of which is the observer-target distance, and the denominator of which is the gun-target distance; that is

Correction factor is $\frac{\text{observer-target distance}}{\text{gun-target distance}}$ or $\frac{OT}{GT}$.

For example, suppose the distance from the observer to the target is 1,000 meters, the gun-target is 1,200 meters, and the deviation of the burst from the target as read by the observer is 60 mils. The correction factor is

$$\frac{1,000}{1,200} \text{ or } \frac{5}{6}$$

The change in deflection equals $\frac{5}{6} \times 60$ mils or 50 mils.

In this method, it is important to round off distances to the nearest 100 meters for simplicity and speed of computation.

FIRE DIRECTION CENTER PROCEDURES

The FDC is located in the headquarters section of the mortar platoon. Through the FDC, the platoon commander is able to control and quickly mass the fire of his entire unit. The FDC is normally located at or near the firing position and maintains contact with the guns by use of wire communications. Calls for fire are reported from all sources directly to the FDC where the targets are plotted on the firing chart (plotting board). From this chart, firing data is prepared by the computer (a member of the FDC) and announced to the mortar crews as fire commands. The FDC can be operated by the computer alone; however, it is desirable to include a radiotelephone operator so the computer can concentrate on the primary duties of computing firing data and issuing fire commands.

PLOTTING BOARD

The plotting board is a fire-control instrument that helps in computing firing data by providing the range and direction from the mortar position to the target. The plotting board is sturdy, easy to operate, accurate, and suitable for use in the field under adverse atmospheric conditions. The plotting board is carried in a durable nylon case. A typical plotting board (M17) is shown in figure 6-24.

The plotting board consists of a pivoted disk of transparent plastic and a removable range scale arm, both attached to a flat base grid.

REFERENCES

Lightweight Company Mortar 60MM, M224 Operator's Manual, TM 9-1010-223-10, Headquarters Department of the Army, Washington, D.C., 1987.

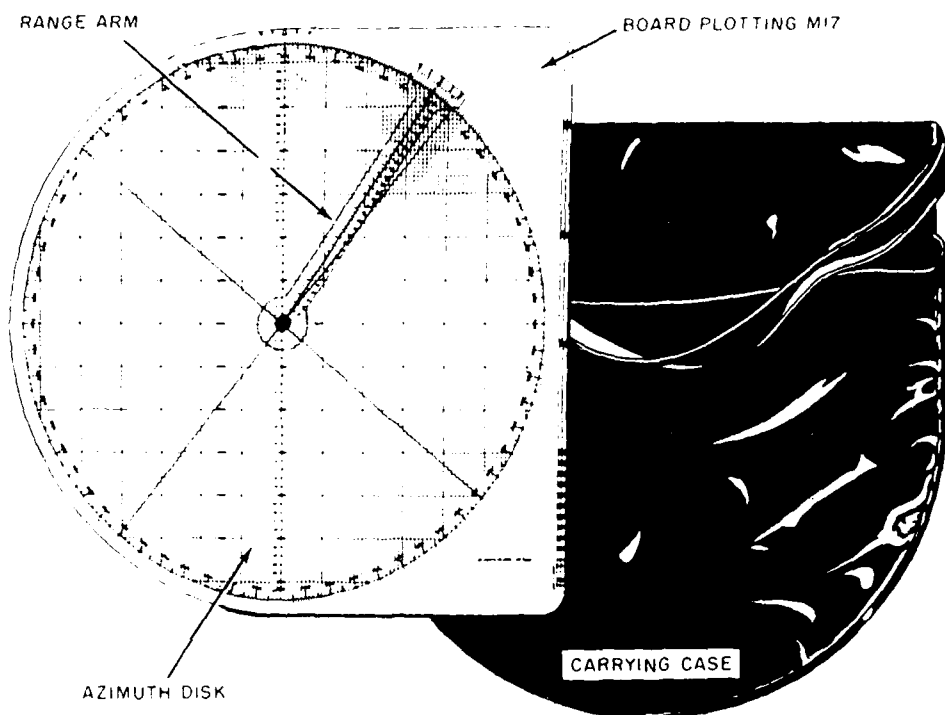


Figure 6-24.—M17 plotting board and carrying case.

CHAPTER 7

HAND GRENADES, LAND MINES, AND BOOBY TRAPS

The reasons SEABEES fight and the types of fighting they do are different from those of other sailors. The primary job of the SEABEE is to build, but you cannot build unless you control the job site. Since in many instances the job site may be in a forward or unfriendly area, the need for being able to conduct a proper defense becomes obvious. For this reason there are certain military requirements imposed on SEABEES.

When required, your job will be to use the defensive techniques and tactics you have learned in military training. The objective of this chapter is to make you familiar with the various types of grenades, land mines, flares, and booby traps you might use or encounter in tactical situations. You will learn how to use them, their components, their safety features, and how to take countermeasures against their effective use by the enemy.

HAND GRENADES

Hand grenades are nothing more than small bombs, containing explosives or chemicals, that can be thrown by hand or rigged as booby traps. Their origin has been traced back many centuries, and it is generally agreed that the Chinese, whom we credit with the invention of gunpowder, were first to employ them. However, it wasn't until World War I that they were sufficiently developed to be effective and safe. By World War II, the grenade inventory had expanded to include smoke grenades for signaling and screening, phosphorus and fragmentation grenades to produce casualties, and gas grenades for both casualty and riot control effects. The grenades being used today are in many respects representative of the entire history of the development of grenades.

TYPES AND PURPOSES OF GRENADES

There are many varieties of hand grenades designed for many purposes. All of these grenades can be broadly classified into four general types: fragmentation, illumination, chemical, incendiary, and practice and training grenades.

Fragmentation Grenades

Fragmentation grenades are used to produce casualties by the high velocity projection of fragments from the grenade case. The M67 fragmentation grenade (fig. 7-1) is the standard grenade used by the SEABEES. It has a smooth sheet metal body and is shaped like a ball. Its outer case is lined on the inside with a serrated wire coil. It is filled with 6.5 ounces of an

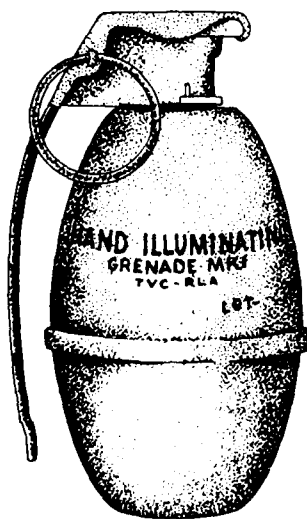


Figure 7-1.—Fragmentation hand grenade, M26A1.

explosive known as Composition B and uses a detonating type fuze. When the detonator causes Composition B to explode, fragments of the body and fuze assembly are hurled in all directions. The M67 weighs 14 ounces and the average man can throw it 40 meters. The effective casualty-producing radius is 15 meters.

Illuminating Grenades

The MK1 (fig. 7-2) is the only illuminating grenade currently available. Its main use is to illuminate terrain in night operations. It provides about 55,000 candlepower for a period of 25 seconds. The MK1 grenade may also be used as an incendiary grenade to start fires in dry grass, leaves, or brush. If the two halves of the body are separated by the burning of illuminating charge, they project with considerable velocity. Friendly forces should take cover until the illumination can be seen. Once the safety pin of this grenade has been removed, *the grenade is armed and MUST be thrown*. DO NOT attempt to replace the safety pin in order to return it to a safe position.



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Figure 7-2.—Illuminating hand grenade, MK1.

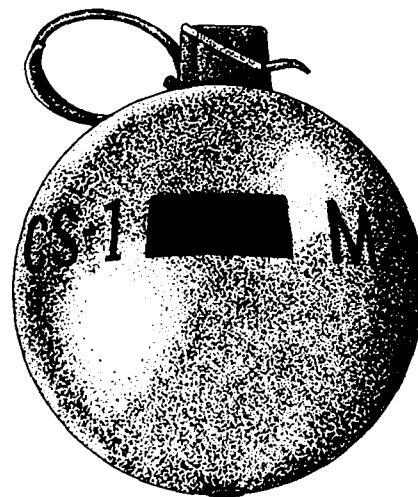
Chemical Grenades

Chemical grenades are chemical-filled munitions designed to be thrown by the individual or projected from the service rifle by means of an adapter. Chemical grenades are used for incendiary, screening, signaling, training, and riot control purposes, as well as booby traps.

Perhaps the most commonly used chemical grenade is the ABC-M25A2, CS riot control hand grenade (fig. 7-3). This is a special purpose bursting type of munition used for control of riots and for training purposes. The grenades are filled with chloracetophenone, a type of tear gas that causes irritation and watering of the eyes, resulting in temporary, partial, or total blindness. The body of the grenade is spherical and is made of plastic. It contains about 3.5 ounces of a mixture of CS and weighs about 7.5 ounces.

This grenade does not have a safety lever as other grenades do. To prevent the grenade from activating after the safety pin is removed, you must keep pressure on the top of the arming sleeve with the thumb of your throwing hand.

The radius of the burst is approximately 6 meters, but fragments of the plastic body occasionally fly as far as 27 meters. Effective



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Figure 7-3.—ABC-M25A2, CS riot control hand grenade.

portions of the agent may be carried as far as 75 to 100 meters downwind. Personnel using these grenades should wear protective gas masks.

Incendiary Grenades

The AN-M14 incendiary (thermite) hand grenade is cylindrical in shape and has a sheet metal body with emission holes in the top (see fig. 7-4). It weighs 32 ounces and contains a filler of 26.5 ounces of TH3 thermite mixture. It uses an igniting fuze which sets fire to the thermite filler after the normal delay. The thermite filler burns for approximately 40 seconds at a temperature of about 4,300 degrees F. A portion of the thermite filler changes into molten iron that flows out of the grenade and produces intense heat over a small area. This molten iron ignites or fuzes whatever it touches. It is used to ignite combustible materials and to destroy all types of equipment. It will burn through about 1/4 inch of steel and will weld together steel or iron machinery parts when molten iron flows between them.

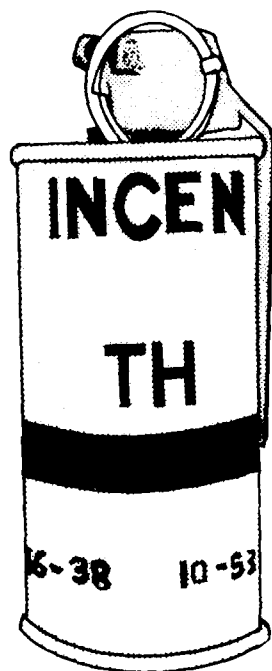


Figure 7-4.—Incendiary hand grenade.

Smoke Grenades

The M34 white phosphorous smoke hand grenade is designed to replace the M15 white phosphorous hand grenade. The body of the grenade is cylindrical with the bottom tapered. It contains a filler of about 12 ounces of white phosphorous and is serrated to break up easily when detonated. The grenade weighs 27.2 ounces and the average SEABEE can throw it 35 meters. The effective casualty radius is 25 meters; however, particles of phosphorous may be thrown as far as 30 meters.

M18 colored smoke hand grenades are the same size and shape as the HC smoke grenades. The M18 will produce red, green, or yellow smoke for 1 to 1 1/2 minutes when ignited. The color of the filler is indicated in writing on the body of the grenade and both ends are colored the same as the smoke the grenade will produce. The M18 is used for ground-to-air or ground-to-ground signaling. See figure 7-5.

NOTE: Under the new standard marking system these grenades have a light green body with black lettering.

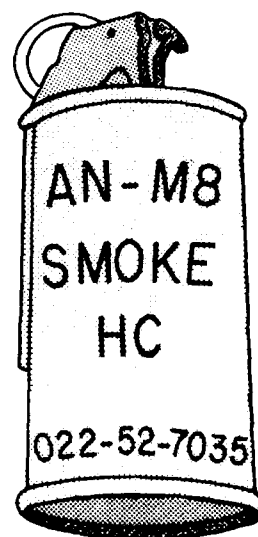


Figure 7-5.—Typical smoke grenade.

Practice and Training Grenades

Practice and training grenades (fig. 7-6) are used for training personnel in the care, handling, and use of hand grenades before using service grenades. Practice grenades simulate functioning of service grenades to provide realism in training. Training grenades are completely inert and do not function in any way.

GENERAL CHARACTERISTICS OF HAND GRENADES

The RANGE of hand grenades, in relation to other weapons, is very short. This range depends entirely on each individual's throwing ability. As a well-trained SEABEE, you should be able to throw a grenade, such as the M67 fragmentation grenade, about 35 to 40 meters.

The EFFECTIVE CASUALTY RADIUS of a hand grenade is defined as the radius of a circular area around the point of detonation within which at least 50 percent of the exposed personnel will become casualties. The radius is about 16.5 yards (15 meters). This radius is small compared to the effective casualty radius of the other SEABEE weapons, such as the 81-mm mortar. You must remember, however, that casualties can and do occur at distances much greater than the so-called effective casualty radius.

Except for the M36A2 fragmentation grenade with the M217 impact fuze, the grenades do NOT

detonate on impact. All casualty-producing grenades (fragmentation and white phosphorus) have a 4- to 5-second delay fuze. Chemical grenades, except white phosphorus and the M25AZ tear gas grenade, have a 2-second delay fuze element.

You can compare a hand grenade to an ordinary firecracker. It consists of a paper body filled with gunpowder that is set off by a fuze. For example, when you light the fuze, it burns until it reaches the powder, which then explodes and shatters the paper body. A hand grenade functions in the same manner and consists of the same principal parts: body, filler, and fuze assembly (fig. 7-7).

The body is the container that holds the filler. It may be made of metal, glass, cardboard, or other suitable material. It may be circular, cylindrical, or lemon-shaped. Regardless of their makeup and shape, all grenade bodies have two things in common: (1) they are hollow to contain a filler and (2) they have an opening or threaded hole to receive the fuze.

Filler is placed in the grenade body. The filler may be an explosive, such as TNT, Composition B (a composite explosive more sensitive than TNT), or black powder. It may also be a chemical, such as tear gas, thermate (incendiary), or white phosphorus.

The fuze assembly is a mechanical and chemical device that causes the filler to detonate or burn.

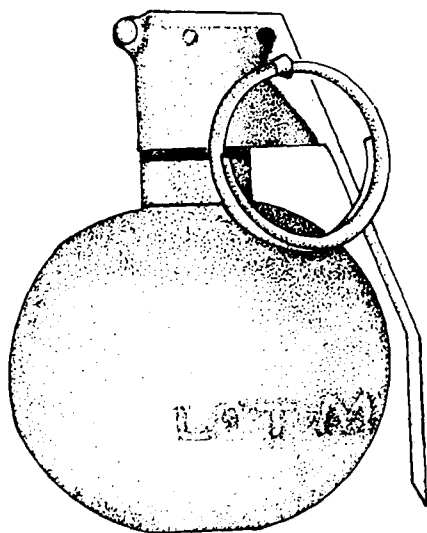


Figure 7-6.—Practice hand grenade.

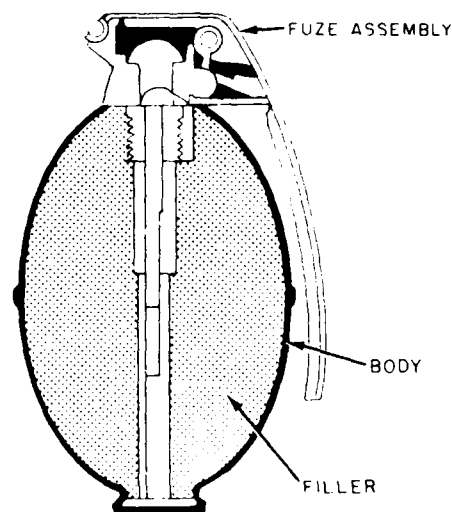


Figure 7-7.—Three main parts of the grenade.

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Fuzes that burn are used primarily with chemical grenades, and fuzes that detonate are used to explode fillers, such as TNT and Composition B.

When you pull the safety pin from the grenade, the safety lever should be held down firmly by your grip. When you loosen or relieve this grip, the safety lever is forced free from the grenade by a spring allowing the striker to hit the primer (fig. 7-8). The primer sets off the delay element that burns into the detonator and igniter; this chain reaction is ended by bursting or burning of the filler in the grenade body. This entire action requires only a few seconds, so stay alert when you are handling and throwing hand grenades.

GRENADE-THROWING PROCEDURES

The two primary objectives of a hand grenade training program are to develop your proficiency in grenade throwing and to overcome any fear that you may have of handling explosives.

Consider safety first when you are determining the proper method of holding the grenade. For maximum safety and throwing comfort, cradle the grenade in your throwing hand with the safety lever held in place by that part of your thumb between the first and second joints (fig. 7-9, view A).

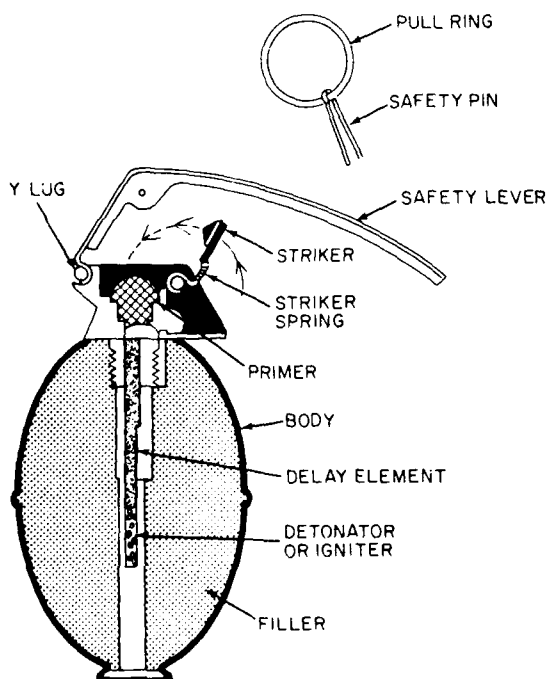


Figure 7-8.—Functioning of the fuze.

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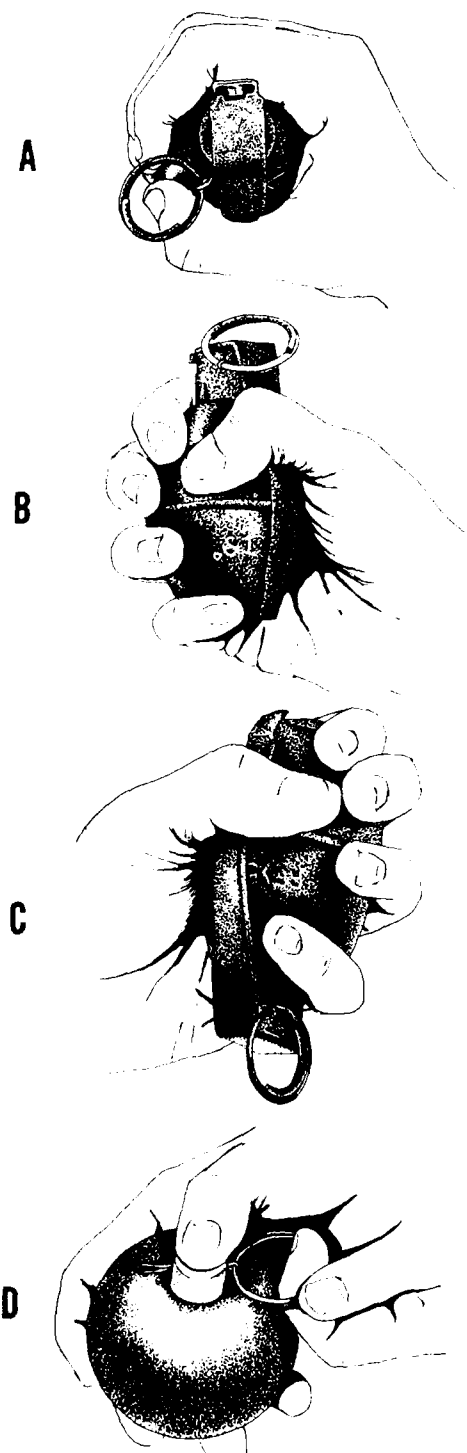


Figure 7-9.—Methods of holding the grenade.

187.84



(A)



(B)



(C)



(D)

Figure 7-10.—Throwing the hand grenade.

187.85

For right-handed personnel, hold the grenade upright (fig. 7-9, view B) in order to position the pull ring where you can easily remove it by the index finger of the free hand. For left-handed personnel, invert the grenade (fig. 7-9, view C) in your hand with the fingers and thumb of the throwing hand positioned in the same manner as by right-handed personnel.

The ABC-M25A2 riot control hand grenade has an arming sleeve which serves the same purpose as the safety lever on other types of grenades. Before throwing the riot control grenade, hold the arming sleeve in place (fig. 7-9, view D) by applying constant pressure with the thumb of the throwing hand.

Since few men throw in the same manner, it is difficult to establish firm throwing rules or techniques. However, there is a recommended method of throwing a grenade that can easily be mastered. By practicing the steps given below, you will develop your throwing proficiency to a point where your reaction to a target will be immediate.

1. First, observe the target to establish mentally the distance between your throwing position and the target area.

2. Hold the grenade at shoulder level with the grenade in your throwing hand and the index finger of your opposite hand grasping the pull ring (fig. 7-10, view A). Remove the safety pin with a pulling, twisting motion. If the situation permits, you should observe the safety pin's removal.

NOTE: If the safety pin cannot be pulled out, lessen the spread of the legs of the safety pin to aid in its removal. However, if the grenade is not used, respread the legs of the safety pin for safety in carrying.

3. As you remove the safety pin, immediately look back at your target.

4. Throw the grenade with an overhead throwing motion, keeping your eyes trained at all times on the target. Release the grenade somewhere forward of your body and in your general field of vision (fig. 7-10, views B and C). In this way you take advantage of the hand-and-eye coordination inherent in most people.

5. Follow through on your throwing motion beyond the point where you released the grenade

(fig. 7-10, view D). This follow-through improves distance and accuracy and relieves the strain on your throwing arm.

6. If available, duck behind cover to avoid being hit by fragments. If no cover is available, drop to the prone position with your helmet facing the direction of the grenade's detonation.

Although proper positioning techniques of throwing hand grenades are usually stressed during military training exercises, your position during a combat situation will be dictated by the amount of available cover and the location of the target. The positions given below point out the use and limitations of each position.

The **STANDING POSITION** (fig. 7-11, view A) is the most desired and natural one from which to throw grenades. This position allows you to obtain the greatest possible throwing distance. To throw from this position use the instructions listed above and shown in figure 7-10.

The **KNEELING POSITION** (fig. 7-11, view B) reduces the distance that you can throw a grenade. Use this position when you have only a low wall, a shallow ditch, or similar cover to protect you. To throw from this position, use the following instructions.

1. Using the proper grip and holding the grenade shoulder high, kneel in the most comfortable manner.

2. Throw the grenade with a natural throwing motion. Push off with your trailing foot to put more force in the throw.

3. As you release the grenade, drop to the prone position or behind available cover to reduce exposure to fragmentation.

Use the **PRONE-TO-KNEELING POSITION** (fig. 7-11, view C) when no cover is available and the grenade must be thrown a greater distance than is possible from the prone position. To throw from this position, use the following instructions.

1. Face the target and assume the prone position. Hold the grenade forward of your head where you can observe the grenade as you remove the safety pin.

2. After the safety pin is removed, quickly assume the kneeling position.



A. STANDING POSITION



B. KNEELING POSITION



C. PRONE-TO-KNEELING POSITION



Figure 7-11.—Throwing positions.

187.86

3. After throwing the grenade, quickly return to the prone position with your helmet facing the direction of the target.

The **ALTERNATE PRONE POSITION** (fig. 7-12, view D) reduces both the throwing distance and accuracy. This position is used when you are pinned down by hostile fire and are unable to rise and engage your target. To throw from this position, use the following instructions.

1. Lie on your back with your body perpendicular to the intended line of flight of the

grenade. Hold the grenade at shoulder level as in the standing position.

2. Your right leg (left leg for left-handed throwers) is cocked with your foot braced firmly against the ground. After removal of the safety pin, hold the grenade away from your body with your arm cocked for throwing.

3. With your free hand, grasp any object that is capable of giving you added leverage. This leverage will increase your throwing distance. In throwing the grenade, push off with your rearward foot to give added power to your throw.



PULLING THE PIN



PREPARING TO THROW



FOLLOWING THROUGH



FOLLOWING THROUGH

AN ALTERNATE PRONE POSITION

187.86.1

Figure 7-12. Throwing positions—Continued.

After throwing the grenade, roll over onto your stomach and press yourself flat against the ground.

HAND GRENADE SAFETY

This section deals with safety precautions that must be observed by the handlers and throwers of all hand grenades, and by other persons who may be located within a grenade's danger area.

Any handler or thrower of a casualty-producing hand grenade or person who is within the danger area (approximately 50 meters) of the grenade must wear a steel helmet.

No hand grenades, other than fuze practice grenades, will be defuzed by any person EXCEPT qualified and authorized ordnance maintenance personnel.

When handling grenades armed with the impact detonating fuze, do NOT release the safety lever before throwing NOR observe the grenade's impact. Wait at least 5 minutes before approaching a dud. If a grenade armed with the

impact detonating fuze is accidentally dropped after the safety pin has been removed, the grenade MUST be picked up and thrown to a safe area. Under NO circumstances will the grenade be kicked or tossed into a sump or ditch, since any sudden jarring of the grenade after the arming delay is expended will cause detonation.

Do NOT remove the safety pin on a grenade until you are ready to throw it. In training, once you remove the safety pin, it must not be placed back into the grenade; the grenade must be thrown.

You, or anyone else not experienced in ordnance disposal, must not recover, handle, or otherwise tamper with dud grenades.

If you should accidentally drop a casualty-producing hand grenade after pulling the safety pin, shout GRENADE to alert other personnel in the area and ensure that the grenade is picked up and thrown in a low arc into a safe area.

Under no circumstances will you attach grenades to clothing or equipment by the PULL

RING. Attaching grenades to clothing or equipment by the pull ring can easily result in the safety pin being accidentally removed from the grenade.

When handling a noncasualty-producing hand grenade, such as the chemical type, you should not be closer than 10 meters to it while it burns. You should not look directly into the thermate mixture since it may cause temporary blindness or even permanent eye damage.

The safety lever of a chemical hand grenade, other than the ABC-M25A2, should not be released before the grenade is thrown because of its extremely short time-delay period.

Riot control hand grenades should not be thrown into a closed area nor should they be detonated within 5 meters of personnel.

Smoke hand grenades should not be used in closed area.

At least a 30-minute waiting period should elapse before you approach a chemical grenade dud, and then only authorized ordnance disposal personnel should approach it.

LAND MINES

A land mine is a concealed explosive charge, placed in an area where it can be detonated by contact with enemy personnel or vehicles. Detonation can be initiated by pressure, pull, or electrical action. The mechanism of a pressure mine is

shown in figure 7-13. The mine is buried with the fuze pressure plate just above the ground surface and detonates when the plate is pressed down.

A pull-action mine is one that is detonated by a pull on a trip wire, stretched where enemy personnel or vehicles may contact it. A pull-action mine is usually also a pressure mine. Whether it is used as a pull-action or pressure mine depends on whether or not the ground surface makes the concealment of a trip wire possible.

For pressure installation, bury the mine with the top of the fuze flush with the ground surface and only the prongs protruding above. For trip wire installation, install it with the top cap of the fuze, as well as the prongs, protruding above the surface. Run trip wires from the fuze cap to stakes or other anchorages, in feasible directions.

An electrical-action mine is exploded by a remote-control firing device of the type used for blasting in construction.

Except for the M18A1 antipersonnel mine described below, mines are NOT authorized for use by the Naval Construction Force. Personnel who encounter any other types of mines should not attempt to disarm or employ them, nor handle them in any manner. If they are located in the field, you should mark them clearly and give their locations to the battalion security officer or authorized ordnance disposal personnel.

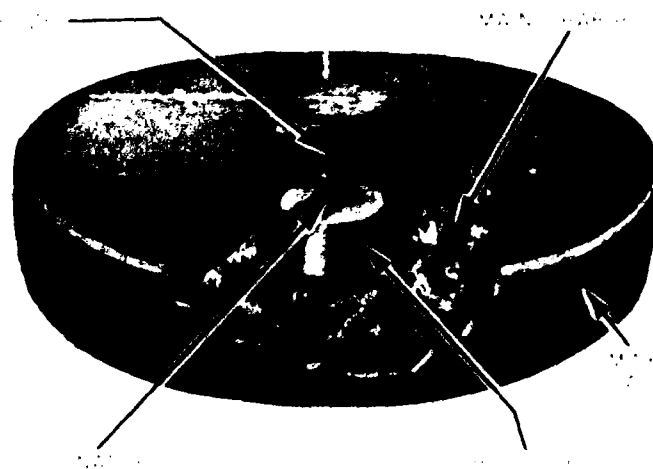


Figure 7-13.—Typical pressure-type land mine mechanism.

THE M18A1 CLAYMORE MINE

The M18A1 Claymore mine, currently the only mine authorized for use by the SEABEES, is used only as an electrically controlled, one-shot

weapon. It is used for support of other weapons employed in the unit's final protective fires.

The M18A1 antipersonnel mine (fig. 7-14) was standardized in 1960. It is a directional, fixed-fragmentation mine, and is designed

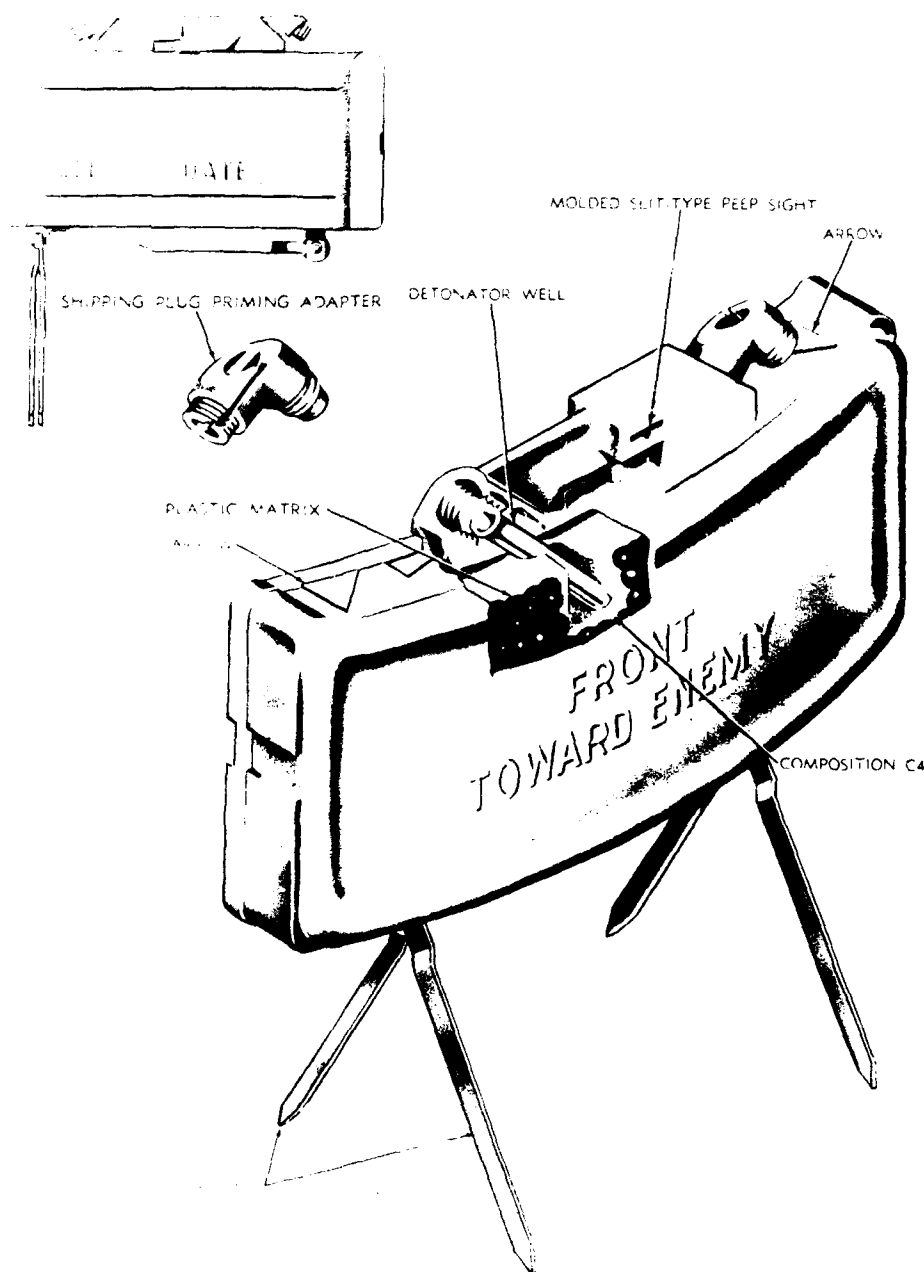


Figure 7-14.—The M18A1 antipersonnel mine (Claymore).

primarily for use against massed infantry attacks. The Claymore mine is equipped with a fixed plastic, slit-type sight, adjustable legs, and two detonator wells. The mine and all its accessories are carried in the M7 bandoleer (fig. 7-15).

The mine weighs about 3 1/2 pounds and is 8 1/2 inches long, 1 3/8 inches wide, and 3 1/4 inches high. The outer surface is a curved rectangular, olive drab, molded plastic case. The front portion of the case has a fragmentation face containing steel spheres embedded in a plastic matrix (enclosure). The back portion of the case contains 1 1/2 pounds of Composition C4 (composite explosive).

When detonated, the M18A1 mine will project steel fragments over a 60-degree fan-shaped pattern approximately 6 feet high and 50 meters wide at a range of 50 meters (fig. 7-16). These

fragments are moderately effective up to a range of approximately 100 meters and can travel up to 250 meters. The optimum effect range, the range at which the most desirable balance is achieved between lethality and area coverage, is 50 meters.

M57 FIRING DEVICE

One M57 firing device (fig. 7-17) is issued with each M18A1 mine. The device is a handheld pulse generator. A squeeze of the handle produces a double 3-volt electrical pulse of sufficient energy to fire the electric blasting cap through the 100 feet of firing wire issued with the mine. On one end of the firing wire is a rubber connecting plug with a dust cover.

The safety bail on the firing device has two positions. In the upper SAFE position, it acts as a block between the firing handle and the generator. In the lower FIRE position, the generator can be activated.

INSTALLATION AND FIRING

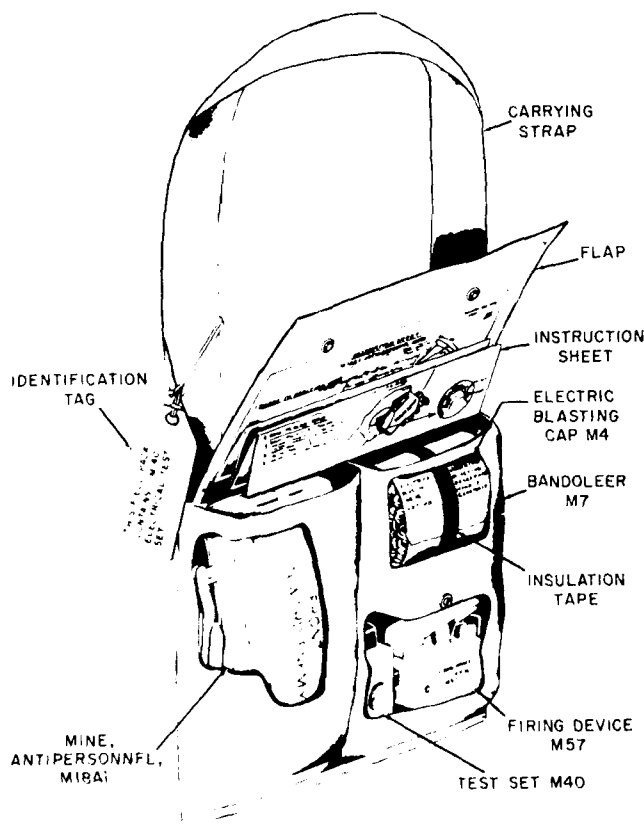
Complete instructions for installing, arming, testing, and firing the M18A1 antipersonnel mine are attached to the flap of the M57 bandoleer. The instruction sheet is shown in figure 7-18, and the directions should be carefully followed by users of these mines.

COVERAGE AND METHODS OF FIRE

Since the M18A1 can only be fired once, FIRE DISCIPLINE is of major importance. The mine should not be used against single personnel targets; rather, it should be used for its intended purpose—massed personnel. When lead elements of an enemy formation approach within approximately 20 to 30 meters of the mine, it should be detonated.

EFFECTIVE COVERAGE of the entire front of a position by the mines can be accomplished by placing them in a line no closer together than 5 meters and no farther apart than 45 meters. A preferred lateral and rearward separation distance is approximately 25 meters.

METHODS OF FIRING the M18A1 mine can be in either the controlled or uncontrolled role. An uncontrolled mine is essentially a booby trap,



187.43

Figure 7-15.—The M18A1 antipersonnel mine and accessories packed in the M7 bandoleer.

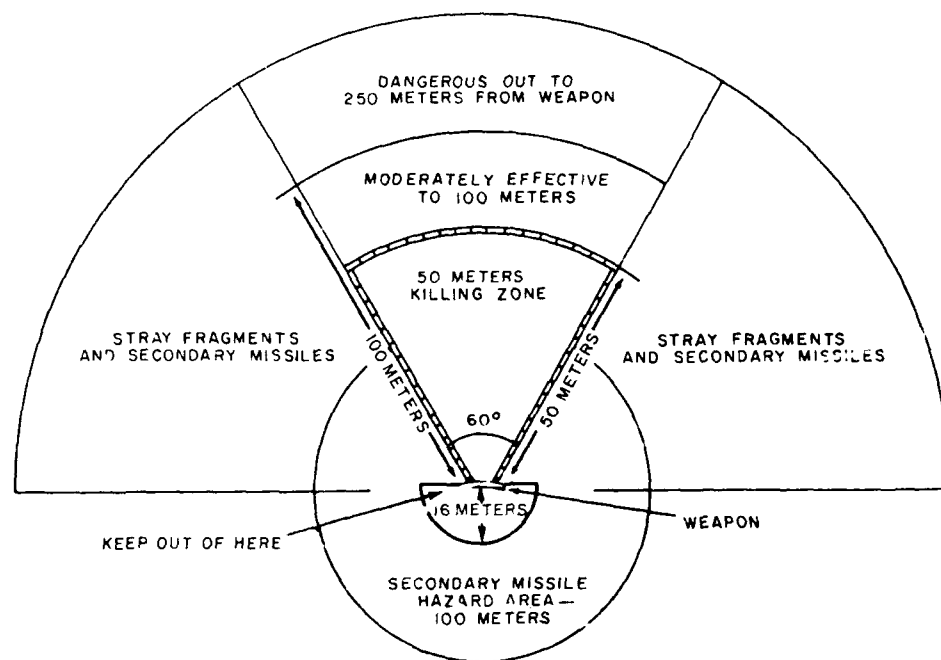


Figure 7-16.—Range and effects of the M18A1.

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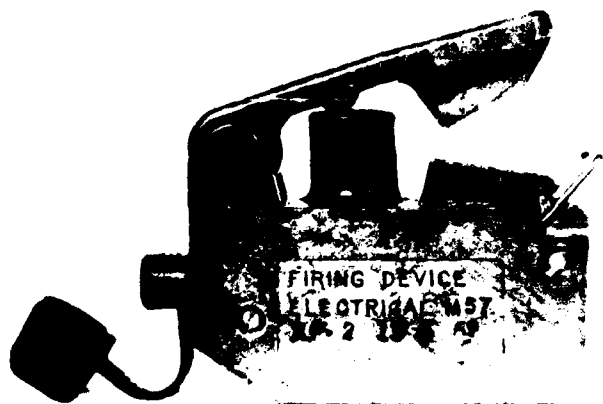
and its use by SEABEES is not authorized. In a controlled role, the operator detonates the mine as the enemy approaches within the killing zone. The operator can, by use of either an electrical or a nonelectrical firing system, control

detonation. In almost all cases, mines employed by the SEABEES will be fired electrically with the M57 firing device.

TRIP FLARES

A trip flare is used primarily to illuminate and to give warning of attacking or infiltrating enemy troops. Normally, it is placed in the path of, and activated by, an advancing enemy. Trip flares are usually available to the individual or small unit and can provide temporary close-in illumination. They are not suitable for producing continuous illumination and have little, if any, application in other than defensive operations.

The M49 trip flare resembles a hand grenade in size and shape, except that it is provided with a bracket for attachment to a tree or post and a trigger mechanism for firing. The flare burns with a yellowish light and illuminates an area radius of approximately 300 meters. The trip fuze M12 resembles the hand grenade fuzes for cylindrical hand grenades, but it has no body tube or delay charge.



187.45

Figure 7-17.—The M57 firing device.

The flare has a laminated paper body containing the 11-ounce flare charge and is closed at both ends by metal caps. The upper cap has taped holes and a threaded central hole for the trip fuze M12. The mounting bracket and trigger mechanism are attached to the base cap. The bracket consists of a triangular anchor clip with one hole at its lowest end, for insertion of a nail, and two square holes to permit engagement with tabs of the mounting plate, which also has two holes for insertion of nails. The trigger mechanism consists of a spring-loaded trigger. One end of the trigger has the spring assembly anchored thereto and has a hole for insertion of the trip wire. The other end of the trigger has a narrow tongue used to hold the safety lever in place when the trigger is turned in the vertical position. The spring is wound around the trigger pivot.

The location chosen for the flare should be to the right (looking toward the enemy) of the field to be illuminated, so the trip wire, when attached, will run to the right of the flare when facing the trigger. Using two of the nails supplied, nail the holder plate with ends of the two tabs upward to a stake, post, or suitable support at the height desired for the trip wire (usually 15 to 18 inches above ground). Mount the flare by sliding the two square holes of the anchor clip over the mating tabs on the holder and press the flare down until it is locked in position. If desired, the third nail may be driven through the hole in the lower end of the anchor clip.

Fasten one end of the trip wire to the post, stake, or other rigid object at the desired distance from the flare (usually about 40 feet) and at the right of the flare when facing the flare trigger.

Press the fuze safety lever down with one hand and rotate the trigger one-quarter turn counterclockwise against the spring pressure with the other hand to the vertical position so the lower end of the safety lever is behind the upper end of the trigger.

Pull the loose end of the trip wire taut and fasten it to the hole in the lower end of the trigger.

At this point, check to see that the trip wire is taut and fastened at both ends, and the trigger is vertical with the fuze safety lever behind the upper end of trigger so that when the pull ring and safety pin are withdrawn, the safety lever will still be held by the trigger.

Hold the lever with one hand while carefully withdrawing the pull ring and safety pin from the flare fuze.

Very carefully release the hold on the safety lever, while making sure the lever will be held in place by the upper end of the trigger.

To remove a trip flare, carefully depress the safety lever to align the holes in the lever and the fuze and insert the safety pin. Detach the trip wire from the trigger while holding the safety lever against the flare and rotate the trigger to its original position. Remove the nails from the holding plate and the anchor clip. Return the flare to its original position and packing.

BOOBY TRAPS

A booby trap can be an explosive charge, a nonexplosive device, or other material. Its intended use is to incapacitate, wound, or kill an unsuspecting person when he disturbs an apparently harmless object or performs a presumably safe act. Two types are in use—improvised and manufactured. Improvised booby traps are constructed from standard firing devices, explosives, weapons, missiles, or other materials generally used for other purposes. They are placed wherever enemy troops are likely to assemble or pass, as in buildings, shelters, minefields, fords, around obstacles, and along paths, roads, and bridges. Improvised booby traps are often attached to some object that can be used or that has souvenir appeal. Manufactured booby traps are standard devices made at a factory that are useful objects, such as pipes, books, or bottled drinks, that explode when picked up or used. When left scattered about by a retreating force, they inflict casualties and cause confusion among advancing enemy troops.

Booby traps laid in and along paths and trails are both delaying and frustrating obstacles to foot troops and patrols. Improvised shrapnel charges use either pressure-release or pull/pull-release firing devices. Pressure-release devices are placed under stones, wood, or other objects, and pull or pull-release firing devices are tied to a trip wire stretched across the path. Fragmentation hand grenades are often used for this purpose. One use is to place the grenade with the safety pin removed under an object so the safety lever will be released when the object is moved.

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Other uses include the following:

GRENADE TRAP. A fragmentation grenade is attached to low underbrush, an anchor stake, or a tree trunk alongside the path. One end of a trip wire is tied to an anchor stake across the path, then stretched to the fragmentation grenade where the other end is tied to the grenade safety ring. A pull on the trip wire removes the safety ring, firing the grenade.

HAND GRENADE IN CAN. A C-rations can is attached to an anchor stake or tree trunk alongside the path. A hand grenade is placed base first into the can so that the can retains the safety lever in the safe position. One end of a trip wire is tied to an anchor stake across the path and the wire is stretched across the path and tied to the hand grenade. The grenade safety pin is then removed. A pull on the trip wire will pull the grenade from the can, thus releasing the safety lever and firing the grenade.

MUD BALL MINE. The safety pin is removed from a fragmentation hand grenade and replaced with a 10- to 12-inch wire. A base of mud is molded around the grenade, leaving the ends of the wire exposed. When the mud has hardened enough to hold the grenade safety lever in place, the wire is removed, thus arming the grenade; however, the grenade will not detonate until its mud case is broken. The mud ball is placed on a trail or anywhere troops may walk. Stepping on the ball breaks the dried mud and releases the safety lever, detonating the grenade.

NONEXPLOSIVE DEVICES

Guerrilla forces, particularly in jungle areas, often employ booby traps that do not use explosives but which are equally effective as casualty producers. All the devices are improvised from locally available materials—nails, bamboo, ropes, vines, stones, logs, and rubber—to serve the conditions that prevail at the time and place. The devices discussed in this section have been encountered on many occasions, but variations of these devices should be expected.

PUNJI STAKES. Punji stakes are needle-sharp bamboo spikes, sometimes barbed or fire-hardened, used to injure unsuspecting persons who step or fall on them. The pointed ends are often treated with excrement or poison so the wounds may become infected or even cause death.

Punji stakes are placed in the ground to protrude just enough to inflict injury. They are often used on prospective landing zones to wound personnel as they jump from a helicopter to the ground. They are sometimes used along paths to hamper movement. Quite often they are placed on the banks of gullies and streams where troops are likely to jump from one side to the other. They are also used along roads at the entrances to villages or at ambush sites.

FOOT TRAPS. These are small pits combined with spike board plates or punji stakes that are placed along roads, paths, and trails or wherever foot traffic is likely.

Spike board foot traps are small pits, the bottoms of which are lined with boards through which spikes have been driven. The top of the pit is camouflaged. A person stepping on the camouflage material falls through and impales his foot on the spikes. The pits are usually about 18 inches square and 12 inches deep. The spikes used in these devices vary greatly, depending on what is available. Long nails, unimproved or sharpened or barbed, are the type most commonly used. Heavy gauge wire and metal rods, such as welding rods, have also been employed. The spikes are driven through small lengths of board and placed on the ground in dense grass and undergrowth. Stepping on one of the devices causes a serious foot wound requiring evacuation of the victim.

DEADFALLS. Various devices are suspended in the dense foliage above jungle paths and trails, designed to fall or swing in an arc so as to strike intended victims as they pass below. They are released when unwary victims step on or strike with their foot a trip wire stretched across the path. Some of the devices employed include the mace (a spike-studded log), the spike ball (a concrete or mortar ball into which spikes have been cast), and other deadfalls equipped with spears or spikes.

COUNTERMEASURES

Individual mines and booby traps are most often detected by visual means, by probing, or by electrical detection. Knowledge of the mining practices of a particular enemy often aids in

locating mines. The following are likely locations for mines or booby traps.

1. Potholes, road patches, or soft spots in surfaced roadways.
2. Under the edges of road surfacing at the junction of the surfacing and the road shoulder.
3. On road shoulders where mines are easily laid and camouflaged.
4. At locations that block logical bypass routes around a blown bridge or cratered road.
5. Around the edges of craters and ends of damaged bridges or culverts. Antipersonnel mines are sometimes placed in craters if the craters are likely to be used as shelter from enemy artillery fire or air bombing.
6. In barbed wire entanglements, wire fences, and similar obstacles. In any other type of obstacle, such as abandoned vehicles or among felled tree trunks or limbs across roads or trails.
7. Near any unusual object that may have been placed by the enemy for his own use, such as a minefield marker.
8. In places where it is natural to drive a vehicle, such as turnouts, parking lots, in front of the entrances to buildings, narrow alleys, and airfield runways.
9. Near bodies or souvenir materials, such as pistols, field glasses, and bottles of liquor.
10. In likely bivouac or assembly areas and in buildings suitable for use as command or observation posts.

In spite of a high incidence of mine and booby-trap activity and ingenious methods and techniques, effective defensive measures can be developed and applied in the field. The enemy is not infallible; he does make mistakes, and the material used in mine and booby-trap activities is rarely 100 percent reliable. But do NOT help the enemy by making careless mistakes of your own, such as throwing caution aside when going to the aid of shipmates who have become mine casualties. Learn how to defend yourself against enemy mines and booby traps.

SAFEGUARD MATERIAL. From ports of entry to the most remote battle areas, the enemy will make every effort to obtain needed material and equipment. Enemy efforts can be thwarted by proper safeguards and policing of the battle area. You can do little to prevent the enemy from

picking up artillery and mortar dud shells, but you need not litter the battle area with discarded hand grenades, ammunition, mines, and other items that the enemy can convert to his own use in mine and booby-trap activities.

SAFE INTERVALS. Enemy success in mine warfare is drastically reduced when safe intervals are maintained in the movement of troops and vehicles. The effect of many antipersonnel mines and most hand grenades is such that more than one individual will become a casualty within the effective casualty radius. Well-placed antitank or antivehicular mines can be equally effective against vehicles in convoy that follow too closely.

TRACK VEHICLES. Wheeled and tracked vehicle operators should follow in the tracks of the vehicle ahead when the vehicle is in sight. This will reduce the possibility of detonating a pressure-activated mine that the vehicle ahead may have missed. On the other hand, old tracks should be avoided if possible because mines may well be placed in old tracks.

CONTROL VEHICLE SPEEDS. Though battles have been won through rapid and violent attacking maneuvers, speed of itself does not ensure success. It can just as well cause you to become careless or reckless, which is what the enemy relies on in his employment of mines and booby traps. Also, the speed and spacing of vehicles should be varied to make the timing of controlled detonated mines difficult.

SANDBAG VEHICLES. Sandbag the flooring of vehicles to provide protection for mounted personnel. In addition, place a heavy rubber mat over the sandbags to reduce the chances of injury from fragments, such as stones, sand, shrapnel, and pieces of the bags. To further reduce these chances, sandbags should not be filled with rocks or sand with rocks in it. When riding in sandbagged vehicles, help protect yourself by keeping your arms and legs inside.

DISPERSE KEY PERSONNEL. Key personnel who are prime targets for controlled installed mines must NOT congregate in one vehicle but should be dispersed throughout the column in the convoy.

DO NOT TRAVEL ALONE. Whenever possible, a vehicle should avoid traveling as a single unit. Doing so makes it a good target for guerrillas seeking weapons and other equipment.

CHAPTER 8

ORGANIC COMMUNICATIONS EQUIPMENT

Communications is the voice of command. Without the capability for rapid, reliable, secure and efficient tactical communications, a commander in the field cannot effectively exercise command and control of his forces, call in available fire support, or maintain adequate channels of logistics. In battle, poor communications costs lives. On a construction project, inefficient communications costs time, money, and material. However, even the most advanced and sophisticated communication system is of little consequence in the hands of untrained personnel. Either by design or through necessity, any one of us, as SEABEES, could be called upon to use any part of the battalion's tactical communications equipment in an emergency. Therefore, familiarize yourself with the battalion's communications systems. Know what each system does, how it works, and when and where to use it. The intent of this chapter is to do just that. Don't be a liability to your shipmates. A well-rounded understanding of communications by all hands greatly upgrades the overall operational efficiency of the battalion.

COMMUNICATIONS MEANS

The most common means of communication is simply speaking to one another—voice communication. When you need to communicate over longer distances, your voice is transmitted and received by electrical means, such as radio or telephone. Other means of communicating by sound are by whistles, sirens, horns, gunfire, and so forth. Messages may also be communicated through visual means (hand signals, smoke, and flags) and in writing (orders, messages, and reports). All of these means of communication will be discussed in this chapter.

Effective communications is essential for control of the company and its elements. The company uses a combination of radio, wire, messenger, visual, and sound communications to provide as many ways to transmit messages as conditions will permit. Radio is the primary means of communication in all tactical, on-the-move operations. Communications (COMM) wire is the primary system used during a static defense.

Each commander is responsible for the installation, operation, and maintenance of his

unit's communication system and for its efficient operation as a part of the next higher unit's system. Each commander exercises tactical and technical supervision over the communication system of all the units of his command.

RESPONSIBILITIES

Every SEABEE is responsible for good communications. The importance of passing the word cannot be overemphasized. Knowing what is happening and what is expected aids us in achieving a successful mission. You have to develop good, two-way communications up and down the chain of command if you are to stay alive in combat. The responsibility for communication among units is subject to the following general rules:

- The higher unit is responsible for establishing communication with the lower unit and attached units.

- A unit supporting another unit establishes communication with that unit.

- Lateral communication between adjacent units is established and maintained by the unit on the left to the unit on the right unless directed otherwise by higher authority.

- Although one unit is specifically charged with establishing and maintaining communications with another unit, only mutual efforts of all members of all units assure continual communications.

- The company commander is responsible for the installation, operation, and maintenance of the company communications system and for its efficient operation as part of the battalion system. Instructions about all communications are found in the operation orders.

COMMUNICATIONS

Radio and messengers are the primary means of communication for offensive combat and for other operations involving rapid or extensive

movement. These methods may be supplemented by visual and sound signals. As a SEABEE, you will probably use the radio as the main source of communication while on a convoy, since many of your vehicles have radios mounted in them.

Wire and messengers are normally the primary means of communication in defense. Radio is used if wire service is interrupted after the enemy has made contact or when ordered by a higher command. Two or more wire lines should be installed over different routes to connect two units. This will allow communication to be quickly reestablished if one line goes out. Visual and sound signals may be used to supplement wire in the defense, but only when they will not compromise security.

Visual signals include panel sets, pyrotechnics, smoke of various types and colors, arm and hand signals, flashlight, tracer ammunition, improvised lights, and flags. Higher headquarters normally prescribes the use of pyrotechnics or smoke signals to call for shift, lift, fire, or illumination.

Sound signals are normally used for alarms to warn of air, chemical, biological and radiological (CBR), or ground attack. Whistles, horns, bells, small arms, or other noisemakers may be used for sound signals.

No matter what type of communication is used, assume that you are being monitored by the enemy. This is particularly true of radio, which is the LEAST secure means of communication.

UNDERSTANDING RADIO AND TELEPHONE NOMENCLATURE

The radios, telephone, and the switchboard discussed in this section are those presently on the NMCB Table of Allowance (TOA). To help you understand the component nomenclature and their family names, the following examples are given:

- AN/PRC-47, AN/PRC-68A, and AN/PRC-77 radios

1. The AN indicates the users (Army/Navy).
2. The P indicates the type of installation (pack, portable).
3. The R indicates the type of equipment (radio).

4. The C indicates the purpose (communications).

5. The numbers 47, 68, and 77 indicate the model numbers.

- TA-312/PT and TA-1/PT telephones

1. The TA indicates the type of equipment (telephone apparatus).
2. The numbers 312 and 1 indicate the model numbers.
3. The P indicates the installation (pack, portable).
4. The T indicates the type and purpose of the equipment (telephone (wire) transmitting).

- SB-22/PT switchboard

1. The SB indicates the type of equipment (switchboard).
2. The number 22 indicates the model number.
3. The P indicates the installation (pack, portable).
4. The T indicates the purpose of the equipment (telephone (wire) transmitting).

AN/PRC-68A AND AN/PRC-77 RADIO SETS

The AN/PRC-68A radio set (fig. 8-1, view A) is a short-range, portable, frequency-modulated (FM) receiver-transmitter used to provide two-way voice communication. It can handle ten preset channels, with up to 2,000 channels available. It weighs (including battery and antenna) 3.125 pounds and measures only 9.35 inches by 3.8 inches by 1.52 inches.

This hand-held radio set has a built-in speaker and microphone. An audio connector allows the telephone handset (H-138/U, H-189/U, H-250/U) to be used. There are two antennas available. The range for the short antenna is 330 yards. The range for the long antenna is 1 mile, under line-of-sight conditions.

The AN/PRC-68A is equipped with a low-battery warning tone that begins a beeping sound at 6-second intervals when the battery needs to be replaced. The transmitter has a power output of 1 watt. The frequency range is from 30.00 Mhz to 79.975 Mhz. Operating temperatures range from -40°C to 65°C.

The AN/PRC-77 radio set, shown in view B of figure 8-1, is a short-range, man-packed,

Chapter 8—ORGANIC COMMUNICATIONS EQUIPMENT

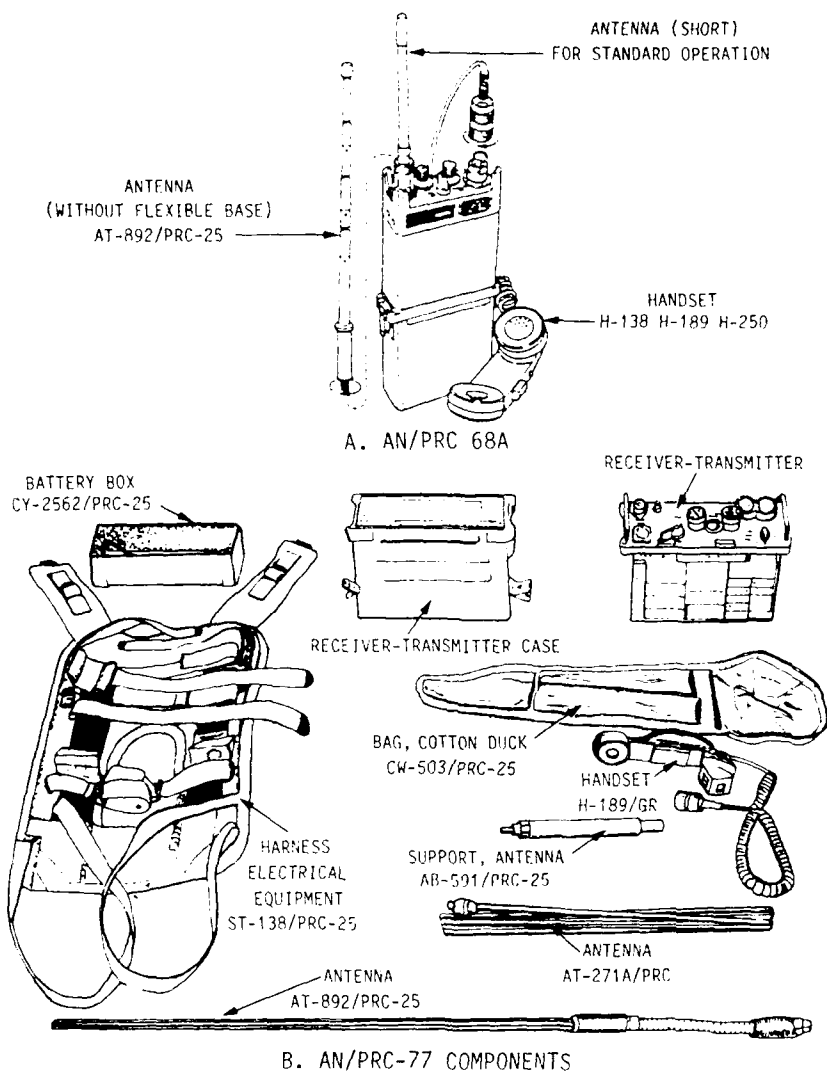


Figure 8-1.—Radio Sets.

portable, frequency-modulated (FM) receiver-transmitter used to provide two-way voice communication. The AN/PRC-77 operates on low power and at very high frequencies (vhf). The location of the equipment greatly affects its operating range. Normally, a line-of-sight range can be expected; that is, if the other station can be seen, satisfactory operation is probable. An intervening hill or a tall building may hamper or prevent contact with other stations.

Valleys, densely wooded areas, and low places are poor sites for setting up communications. A hilltop or a tower location will increase the

operating distance. If possible, avoid locations near a source of electrical interference, such as power or telephone lines, radar sets, and field hospitals.

The AN/PRC-77 consists of a receiver-transmitter (Radio RT-841/PRC-77) and minor components. The receiver-transmitter is held in the receiver-transmitter case by four screws. The battery box is attached to the receiver-transmitter case by two clamps. The complete unit, when assembled, is watertight. All controls are located on the front panel. A battery plug projects from the receiver-transmitter and mates with the

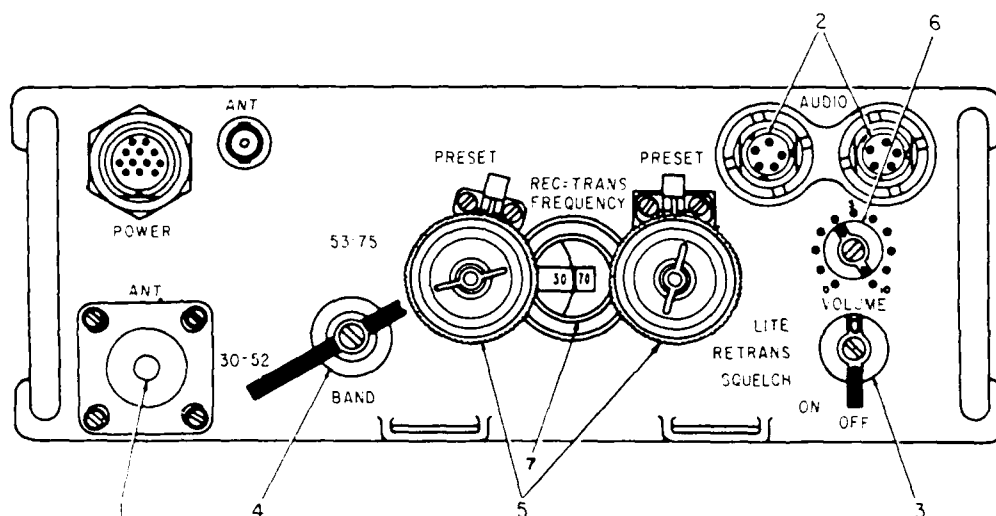
connector of the battery. This set is powered by a BA-4386 magnesium-alloy battery that enables the radio to operate for about 30 hours before a replacement battery is needed.

Minor components include a cotton duck harness (ST-138/PRC-25) so that the radio can be strapped to the operator's back; a short antenna (AT-892/PRC-25) for general, short-range service; a six-section, long antenna (AT-271A/PRC) for maximum range; and antenna support (AB-591/PRC-25) for use with the long antenna;

a handset (H-189/GR) that consists of a microphone and receiver for transmitting and receiving signals; and a cotton duck bag (CW-503/PRC-25) that is divided into several pockets used to store the two antennas, the antenna support, and the handset. Operating instructions for the AN/PRC-77 are shown in figure 8-2.

AN/GRC-160 Radio

Radio Set AN/GRC-160 is for use in vehicles. The AN/GRC-160 uses the same radio (RT-841)



TO OPERATE SET

A. THE NUMBERS OF STEPS 1 THROUGH 6 BELOW RELATE TO THE NUMBERS ON THE DIAGRAM.

- (1) INSTALL THE ANTENNA REQUIRED FOR THE TYPE OF OPERATION IN THE ANT MOUNT.
- (2) ATTACH HANDSET H-189 GR TO EITHER AUDIO CONNECTOR.
- (3) TURN THE FUNCTION SWITCH TO ON.
- (4) TURN THE BAND SWITCH TO THE DESIRED OPERATING FREQUENCY BAND.
- (5) TURN THE MHZ TUNING AND KHZ TUNING CONTROL KNOBS UNTIL THE DESIRED FREQUENCY APPEARS IN THE CHANNEL DIAL (7).
- (6) TURN THE VOLUME CONTROL TO 4.
- (7) PRESS THE HANDSET H-189 GR PUSH-TO-TALK SWITCH AND SPEAK INTO HANDSET. RELEASE THE PUSH-TO-TALK SWITCH TO LISTEN.
- (8) ADJUST THE VOLUME CONTROL (6) FOR A DESIRABLE SOUND LEVEL.
- (9) TO REDUCE THE RUSHING NOISE WHEN NO SIGNAL IS BEING RECEIVED, TURN SWITCH (3) TO SQUELCH.

TO TURN SET OFF

- B. TURN THE FUNCTION SWITCH (3) TO OFF.

Figure 8-2.—Operating instructions for radio set AN/PRC-77.

120.5.2

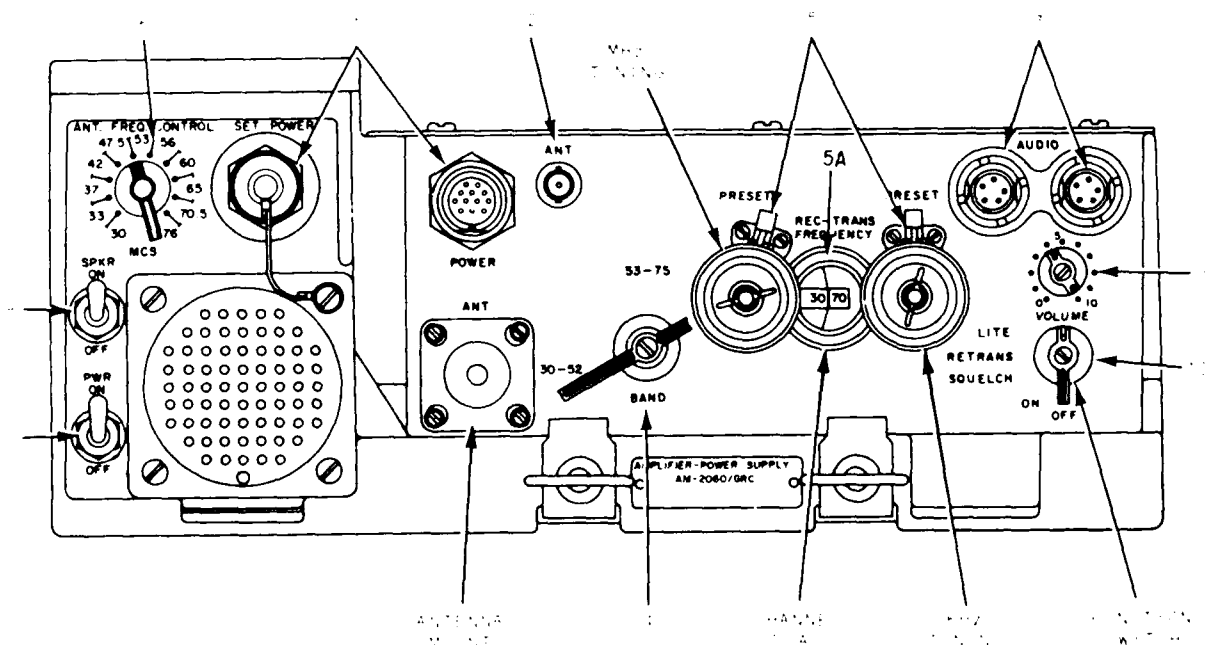
as the AN-PRC-77. An Amplifier AM-2060 provides operating voltage to the RT-841/PRC-77 and, also, has a self-contained loud speaker that amplifies the signal received. The installation kits are provided for specific vehicles and are permanently installed in the vehicles.

To operate the radio, follow these steps. (The numbers of steps 1 through 10 below are keyed to the numbers on the diagram shown in figure 8-3.)

1. Attach Cable CX-4665/GRC between the power connectors (SET POWER).
2. Attach the antenna cable to antenna connector (ANT).
3. Attach Handset H-189/GR (fig. 8-1, view B) to either audio connector (AUDIO).
4. Turn band switch to the desired operating frequency band.
5. Turn the MHz tuning and the kHz tuning control knobs until the desired frequency

appears in the channel dial (5A:REC-TRANS FREQUENCY).

6. Set the antenna frequency control to match frequency appearing in channel dial (5A).
7. Turn the power switch to PWR ON.
8. Turn the speaker switch to SPKR ON.
9. Turn the volume control to 4.
10. Turn the function switch to ON.
11. Press Handset H-189/GR (fig. 8-1, view B) PUSH-TO-TALK switch (on the right side of the handset) and speak into the handset. Release the PUSH-TO-TALK switch to LISTEN.
12. Adjust the VOLUME control (10) for a desirable sound level.
13. To reduce the rushing noise when no signal is being received, turn switch (10) to SQUELCH.



120.5.3

Figure 8-3.—Amplifier-Power Supply AM-2060/GRC and Receiver-Transmitter, Radio RT-505/PRC-25, 77.

Figures 8-4, views A through D, show the components that comprise the AN/GRC-160.

AN/PRC-47 Radio

The AN/PRC-47 radio set, shown in figure 8-5, is a team-pack, transportable, single-sideband (SSB), amplitude-modulated (AM) transceiver (transmitter and receiver combined). It operates in the high frequency range (1 to 11.999 kHz) and

provides reliable ground wave voice and continuous waves (cw) Morse code communications (upper sideband only) over a conservative range of 30 to 90 miles.

The set can be operated from any of the following three power sources: a BB-451 24-volt, silver-zinc battery; a 24-volt electrical system in the vehicle; or a 400 Hz 120-volt generator. The BB-451, a component part of the AN/PRC-47, will operate the radio a minimum of 12 to 14 hours under normal conditions assuming you

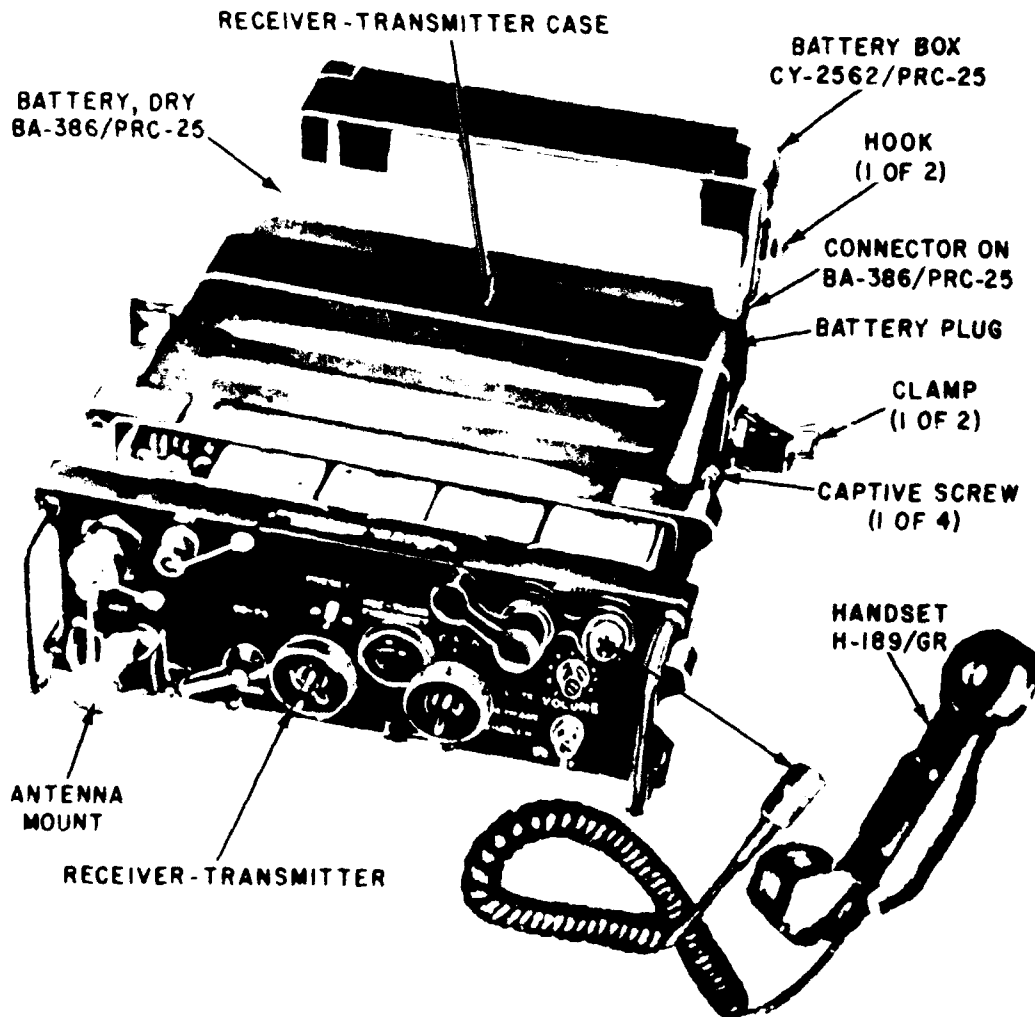
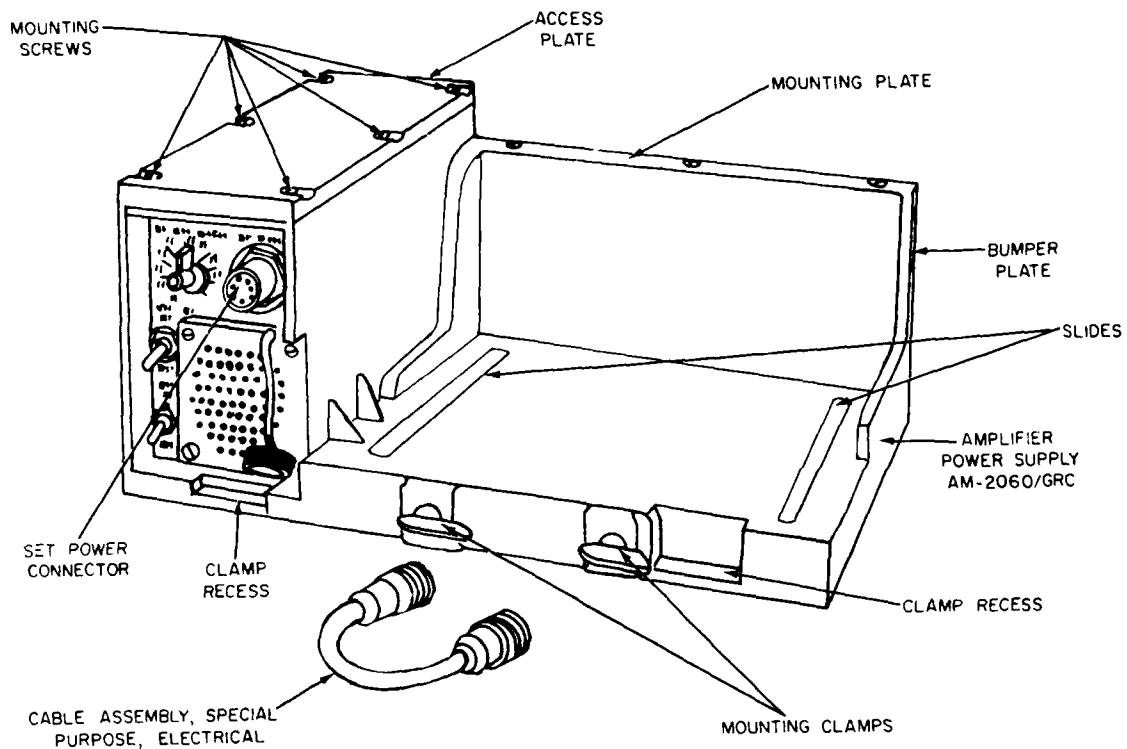


Figure 8-4A.—Receiver-Transmitter 841 for Radio Set AN/GRC-160.

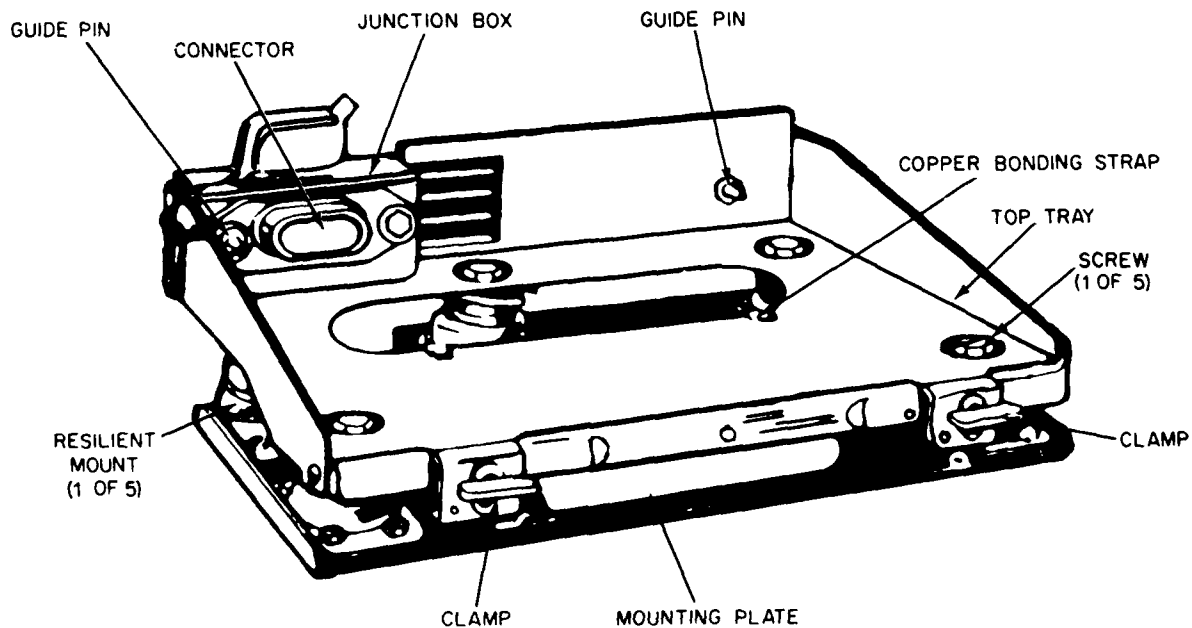
120.5.4

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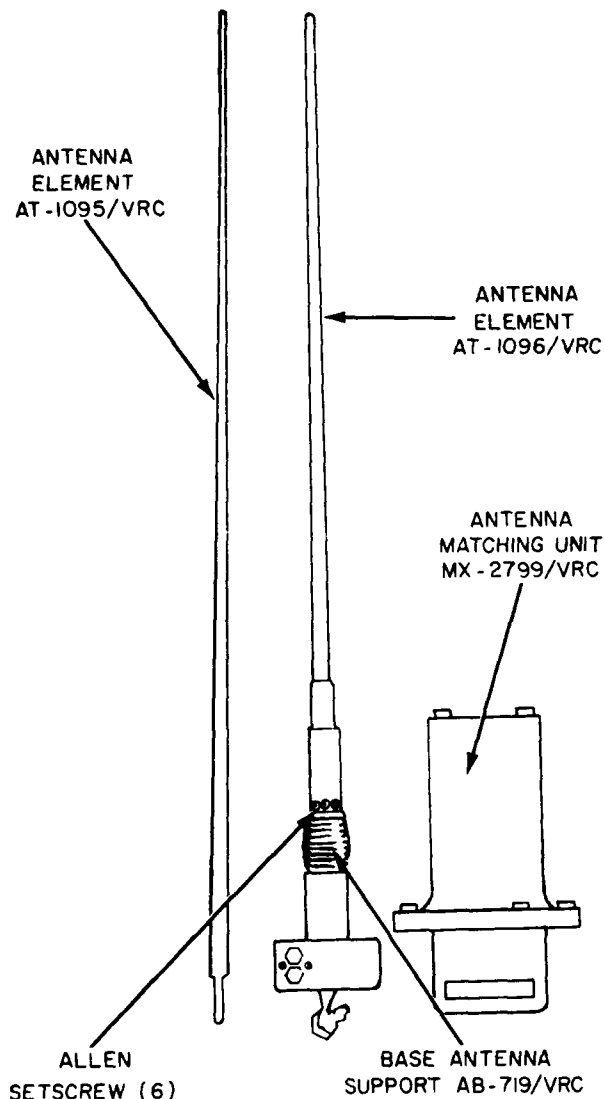
120.5.5

Figure 8-4B.—Amplifier AM-7060 for Radio Set AN/GRC-160.



120.5.6

Figure 8-4C.—Mounting MT-1029/URC for Radio Set AN/GRC-160.



120.5.7

Figure 8-4D.—Antenna AT-912/URC for Radio Set AN/GRC-160.

operate it in a 1-minute-transmit and a 9-minute-receive cycle.

The radio set and its accessories are carried by a two-man team. One man carries the transceiver unit that is mounted on the rucksack frame; the other man carries the battery and accessories that are mounted on another rucksack frame.

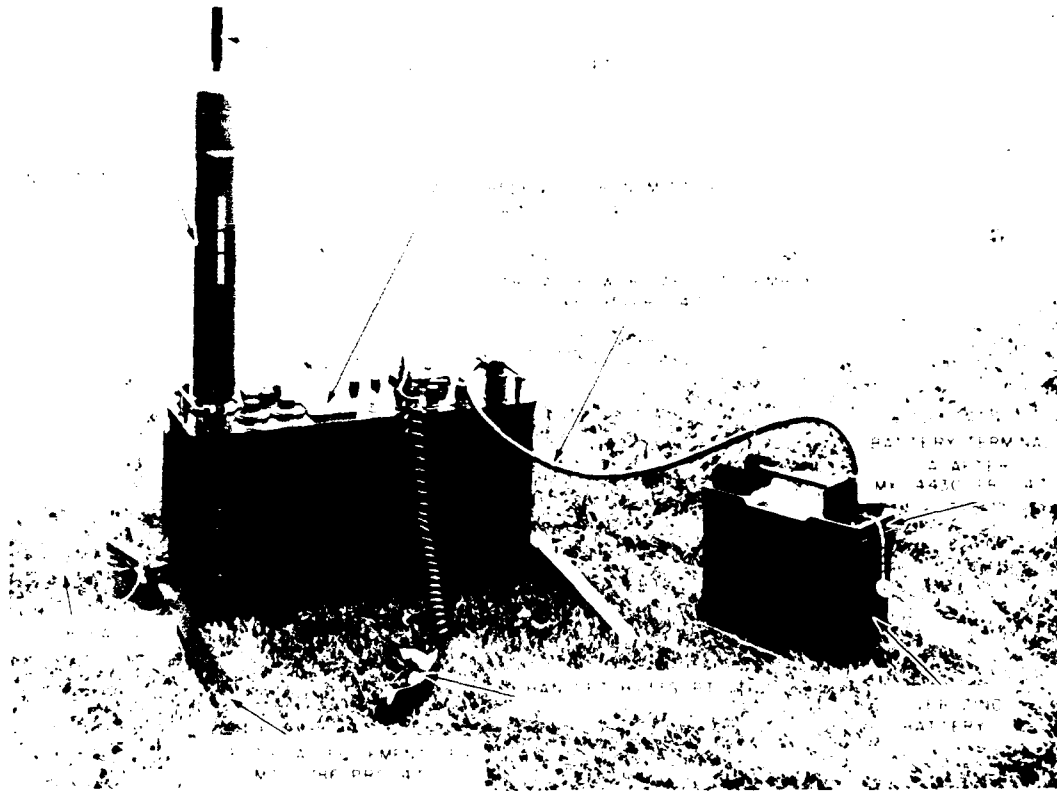
The basic antennas are used with the AN/PRC-47. One is a 15-foot whip antenna; the other a 45-foot wire antenna.

The power source is connected to the AN/PRC-47 by one of the three electrical-power cable assemblies furnished with the set. The power source to use depends upon the type of power supply selected for operation. Always use the correct cable for primary power connections; don't interchange cables.

CAUTION: Don't connect the power cable before connecting the antenna. High radio-frequency (RF) voltages are present in the antenna connector when the transmitter power is on. Also, don't touch the antenna above the insulating boot during transmission because you may be severely burned.

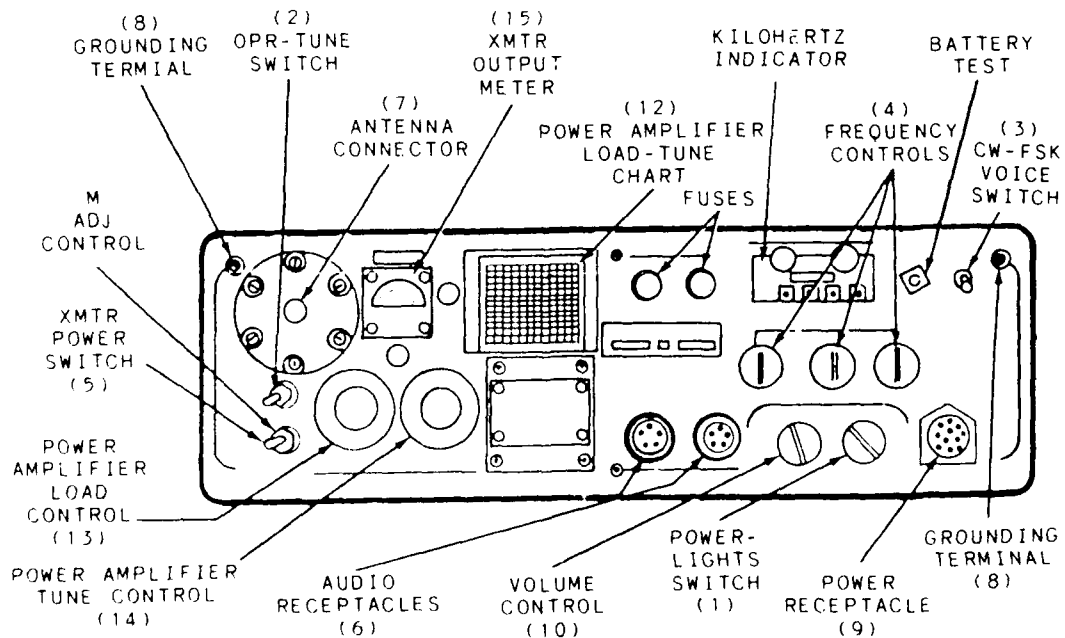
TO OPERATE SET.—Steps 1 through 12 below are keyed to the numbers on the diagram shown in figure 8-6.

1. Check that the XMTR PWR (5) switch is in the OFF position.
2. Set OPR-TUNE switch to OPR (2).
3. Set CW-FSK/VOICE (3) switch to VOICE.
4. Set the operating frequency using the three frequency controls (4).
5. To transmit at low power, set XMTR/-PWR (5) switch to LO; for high power, set the switch to HI.
6. Attach handset H-336/PT (fig. 8-5) to either of the two audio receptacles (6).
7. Attach 15-foot whip antenna or the 45-foot wire antenna (fig. 8-5) to the ANTENNA (7) connector.
8. Ground radio to grounding terminals (8).
9. Connect cable to power receptacle (9).
10. Adjust VOLUME (10).
11. Set POWER to ON (1) and allow the set to warm up at least 1 minute.
12. LOAD and TUNE the radio to the desired frequency. Refer to the load tune chart (12). Obtain the dial setting and set the power amplifier load control (13) and the power amplifier tune control (14) to the settings indicated.
13. Depress handset push-to-talk button (fig. 8-5) and note XMTR (5) output meter for modulation. Speak into the handset.
14. Connect loudspeaker LS-166, if you desire, to the unused audio receptacle (6).



120.101

Figure 8-5.—AN/PRC-47 radio set.



120.5.8

Figure 8-6.—Radio Receiver Transmitter RT-671/PRC-47 control panel.

SEABEE COMBAT HANDBOOK

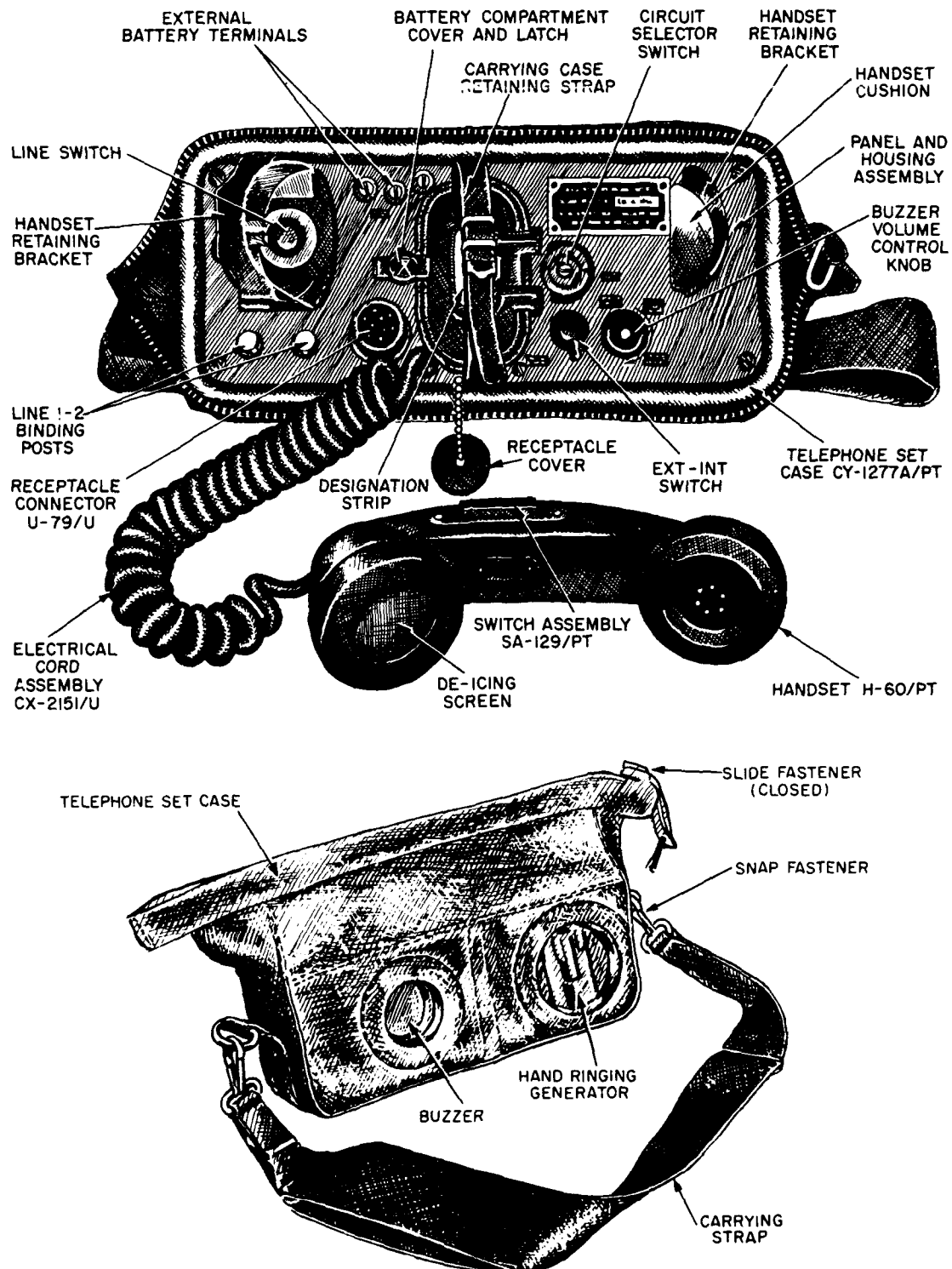


Figure 8-7.—TA-312/PT telephone set.

73.185

TA-312/PT Telephone

The TA-312/PT telephone set, shown in figure 8-7, is a lightweight, waterproof, battery-powered, field telephone designed for local-battery or common-battery circuits. It has facilities for operating push-to-talk radio circuits and a range of 14 to 22 miles. The set weighs about 9 1/2 pounds.

The TA-312/PT consists of three main parts.

1. The telephone set case, made of reinforced canvas
2. The panel and housing assembly that encloses all electrical components
3. A transmitter, a receiver with a push-to-talk switch, and a retractable cord

The power supply for the transmitter consists of two dry-cell batteries (BA-30) in series furnishing 3 volts for local battery (LB) operation. The batteries are used on both local-battery and common-battery signaling (CBS) circuits. One battery is installed in the battery compartment with the positive end up; the other with the positive end down. After you install the batteries, close the battery compartment cover and fasten the cover latch. An external, 3-volt battery source may be used in place of the two BA-30s. Connect the back from the external batteries to the BAT binding posts on the panel. No batteries are required for common-battery operation.

In order to operate the TA-312 with the handset, follow the instructions listed below.

1. Put the EXT-INT SWITCH in the INT position.
2. To place a call in LB operation, leave the handset in the retaining brackets and turn the generator handcrank. Remove the handset from the brackets and listen for the party you are calling to answer.
3. To place a call in CB operation, remove the handset from the retaining brackets and listen for the operator to answer.

4. To talk and listen in CBS operation, push in on the press-to-talk switch when you talk; release it when you listen.

5. To talk and listen in CB operation, you do not operate the press-to-talk switch.

6. To adjust the buzzer volume, request a distant party to signal; then place the handset in the brackets. When a signal is received, rotate the buzzer control for desired volume.

7. To complete the call, place the handset in the retaining brackets. If the set is connected through an LB switchboard, ring off by turning the hand crank.

TA-1/PT Telephone

The TA-1/PT telephone set is a lightweight, waterproof, sound-powered, field telephone for use on field-wire lines to communicate with other field telephones or local, battery-operated switchboards. It is equipped with a visual, incoming-signal indicator and a generator ringer. The TA-1/PT has a talking range of 3 to 6 miles, which is ideal for use on a listening post. The set weighs about 2.7 pounds. The basic parts of the set are shown in figure 8-8.

The TA-1/PT can be used with the SB-22/PT telephone switchboard. To place an outgoing call with the TA-1/PT, first press the generator lever. Then listen for the distant party to answer. When you are ready to talk, press the talk switch. When listening, release the press-to-talk switch. The buzzer will sound for an incoming call except when the buzzer volume control is set in the OFF position. The visual indicator will show four white, luminous markings that remain visible until you press the talk switch. Rotate the buzzer volume knob to adjust the buzzer volume. For maximum volume, rotate the knob counterclockwise as far as possible. For volume less than maximum, first request the distant party or switchboard for a ringing signal. When the buzzer sounds, rotate the buzzer volume knob clockwise until you obtain the desired volume.

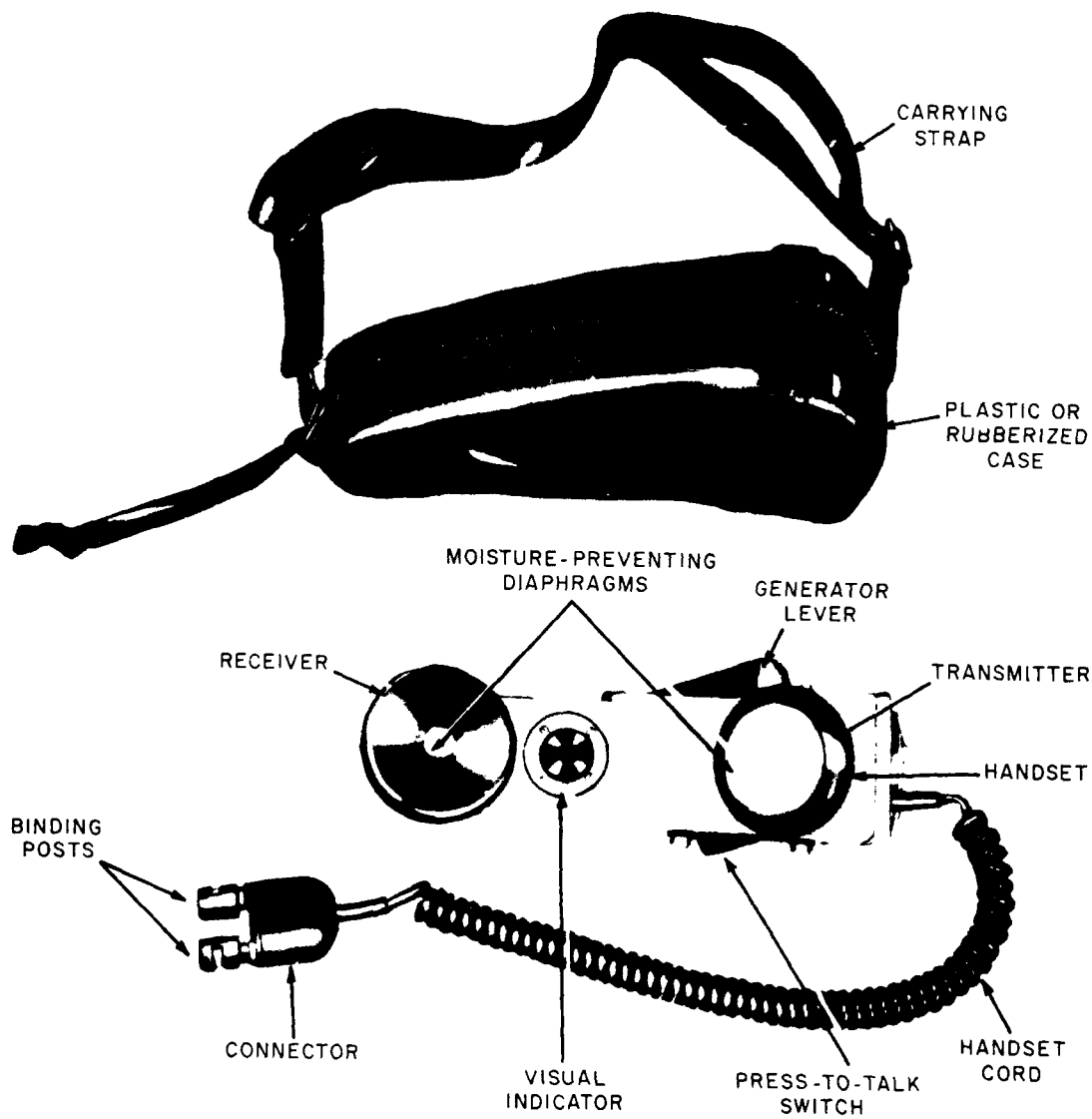
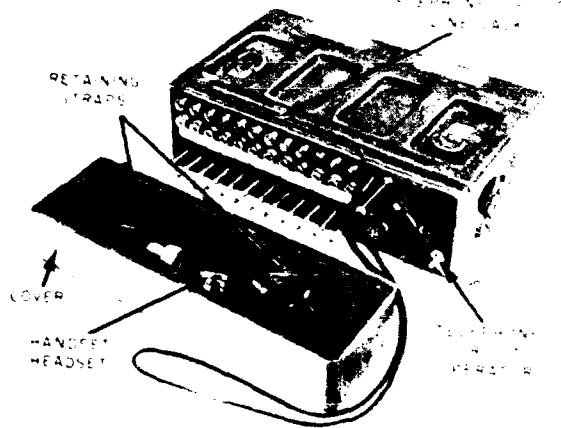


Figure 8-8.—TA-1/PT telephone set.

187.65

SB-22/PT Telephone Switchboard

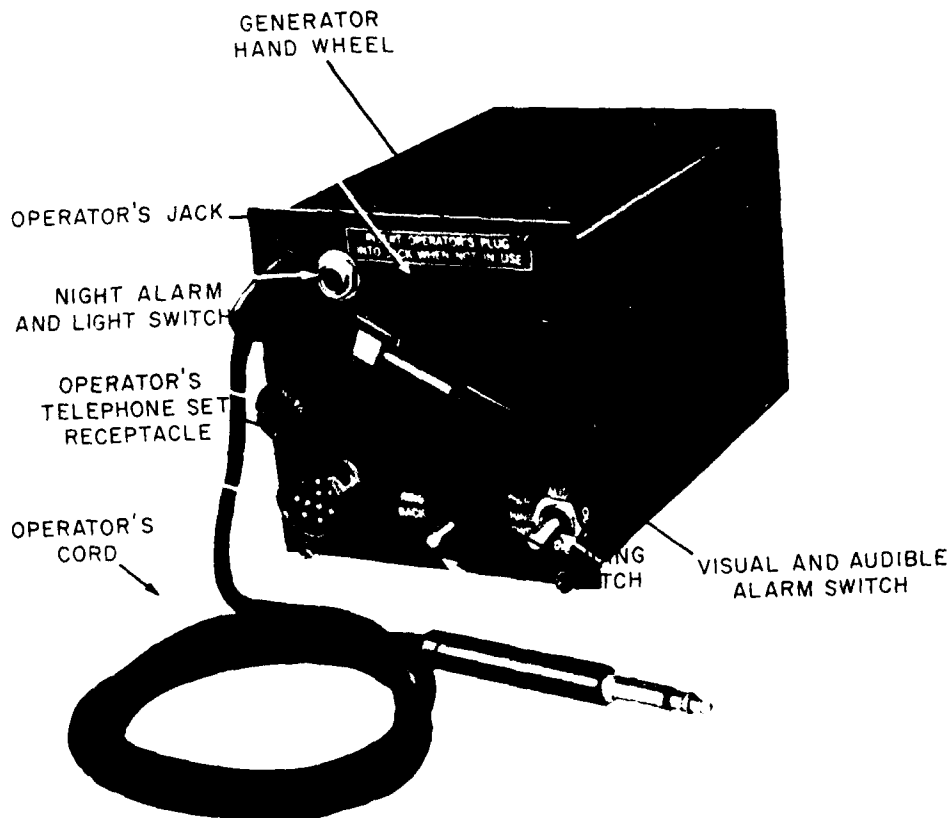


187.66

Figure 8-9.—Manual SB-22/PT telephone switchboard.

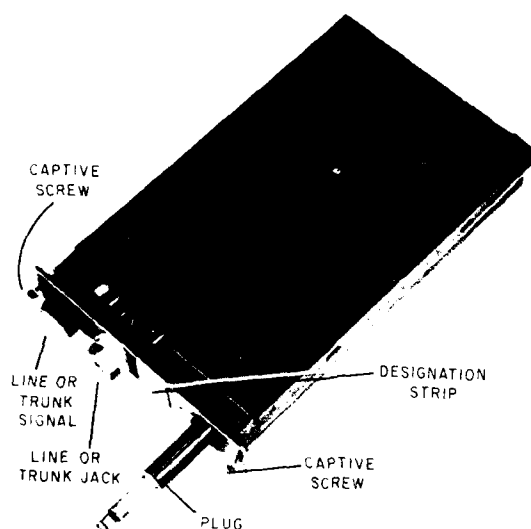
The SB-22/PT telephone switchboard shown in figure 8-9 is a lightweight, battery-operated, field switchboard that has 12 interconnecting voice-frequency circuits. The SB-22/PT is normally used to interconnect local-battery telephone circuits, remote-controlled radio circuits, and voice-frequency teletypewriter circuits. Four BA-30 flashlight batteries provide 3 volts of direct current for its operation. The SB-22/PT has a talking distance of 14 to 22 miles. The switchboard unit weighs about 30 pounds.

The SB-22/PT consists of four basic parts: the operator's pack (fig. 8-10); the line and trunk pack (fig. 8-11); the accessory kits (fig. 8-12); and the handset-headset (fig. 8-13).



187.67

Figure 8-10.—TA-221/PT operator's pack.



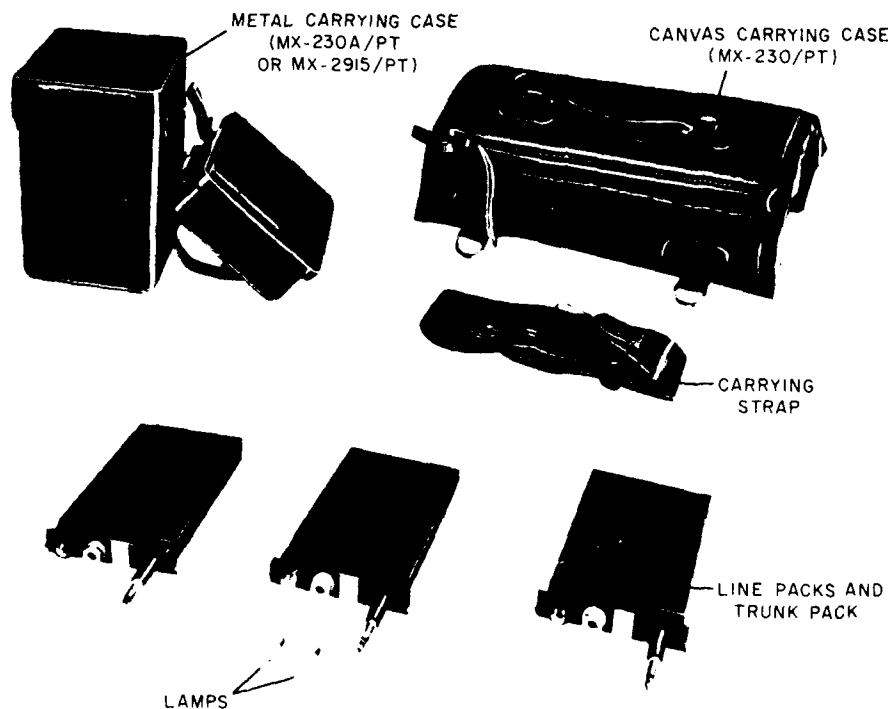
187.68

Figure 8-11.—TA-222/PT line and trunk pack.

Before operating the SB-22/PT switchboard, you should first become familiar with the different controls and their functions. Figure 8-14 lists the controls and their functions in operating the OPERATOR'S PACK; figure 8-15 lists the controls and the functions in operating the LINE and TRUNK PACKS.

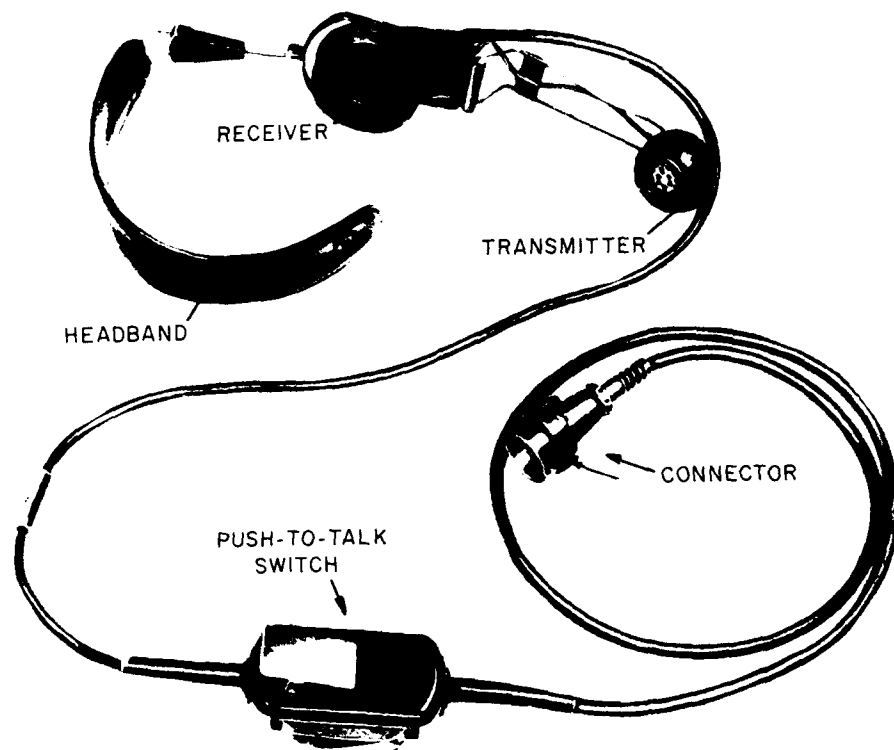
To put the SB-22/PT switchboard into operation, you first put on your HANDSET-HEADSET and connect it to the switchboard in the following manner:

1. Place the headset (fig. 8-13) over your head so that the receiver covers one ear.
2. Position the transmitter directly in front of your mouth.
3. Align the connector (fig. 8-13) on your headset cord with the receptacle on the operator's pack (fig. 8-10). Push it into the connector and turn it to the right to lock it into place.



187.69

Figure 8-12.—Accessory kits, MX-230/PT, MX-230A/PT, and MX-2915/PT.



187.70

Figure 8-13.—Handset-headset, H81A/U.

NOTE: The spacing of the lugs around the inside of the inside of the connector determine the position of the connector.

4. Clip the PUSH-TO-TALK SWITCH on the handset-headset to the front of your shirt.

After inserting the plug of your operating cord into the operator's pack (fig. 8-10), place the push-to-talk switch into any of the positions shown in figure 8-16.

When answering the calling party, watch the signals on the front of the line packs (fig. 8-11); the line signals turn from black to white. Follow the procedures given below to answer the incoming call (fig. 8-17, view A).

1. Remove the plug of the operator's cord from the operator's jack and insert it into the jack

that shows the white line signal (calling party's line signal).

2. Obtain the called party's name or number from the calling party and then proceed to interconnect the parties.

When connecting the calling party to the called party (fig. 8-17, view B), pull out the cord in the calling party's line and insert the calling party's plug into the called party's line jack (fig. 8-17, view C). Then signal the called party by turning the hand-ringing generator (fig. 8-10) rapidly for approximately 10 turns. Do NOT operate the RING BACK-PWR RING FWD switch to either position. Wait for the called party to answer. After the called party answers, remove the operator's plug from the called party's jack and insert it into the operator's jack.

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Control	Function
Ringing switch.	Switch position
	RING BACK . . . Connects ringing current to the calling party's line.
	PWR RING . . . Connects ringing current to the called party's line when an external source of ringing current is used.
Night alarm and light switch.	NA-IN. Permits the lamp to be used as a silent alarm.
	LITE-OUT . . . Lights the lamp to illuminate the switchboard.
Visual and audible alarm switch.	OFF. Disconnects the alarm circuit.
	VIS Connects the lamp to the alarm circuit.
	AUD Connects a buzzer to the alarm circuit.
Operator's cord and plug.	Connects the operator's circuit to the line or trunk pack.
Operator's jack.	Disconnects the operator's telephone set battery when the operator's cord plug is inserted.
Generator hand-wheel.	Provides ringing current when turned.
Operator's telephone set receptacle.	Permits connection of the operator's telephone set to the operator's pack.

187.71

Figure 8-14.—Operator's pack control and function.

Control	Function
Jack (one for each line and trunk pack).	Provides access to the line or trunk.
Cord plug (one for each line or trunk pack).	Permits interconnection of lines or trunks through the jacks.
Signal (one for each line or trunk pack).	Indicates the circuit requires attention when operated to the <i>white</i> position.

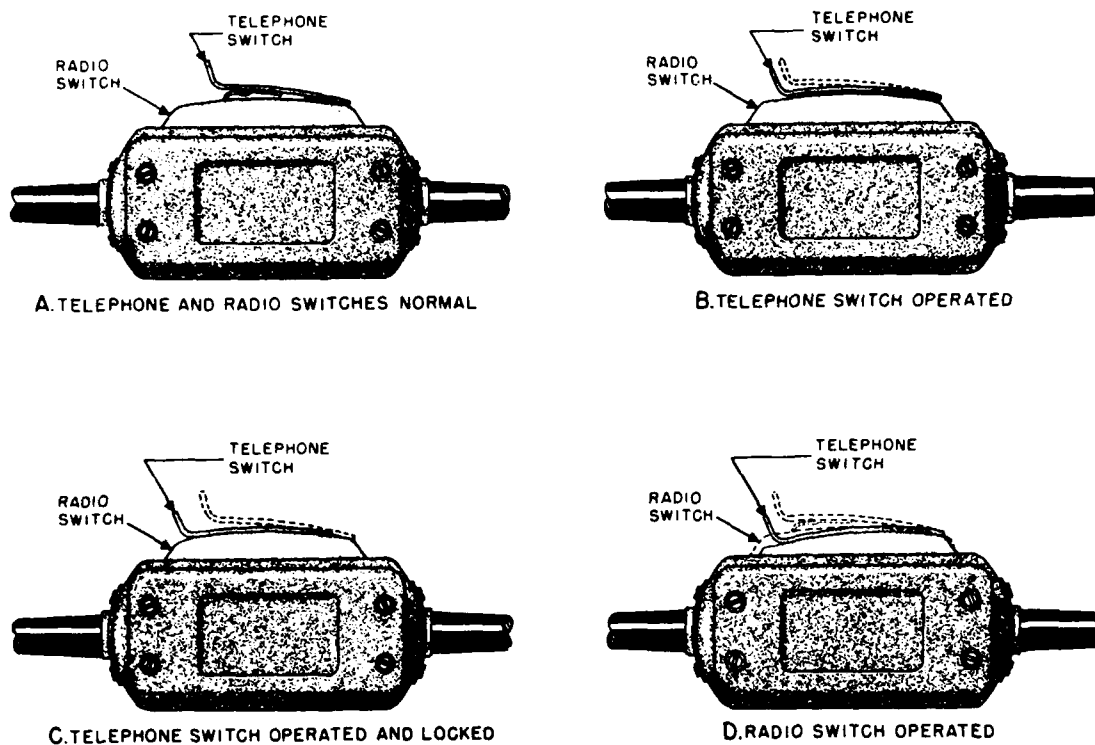
187.72

Figure 8-15.—Line and trunk packs control and function.

After the calling and called parties finish talking, both parties should ring off. The ring-off signal will cause the calling party's line to turn white. If you should have to challenge the ring-off signal, remove the operator's plug from the operator's jack and insert it into the calling party's jack. Ask the parties if they have finished. If no one answers, disconnect the circuit. Remove the operator's plug from the calling party's jack and insert it into the operator's jack.

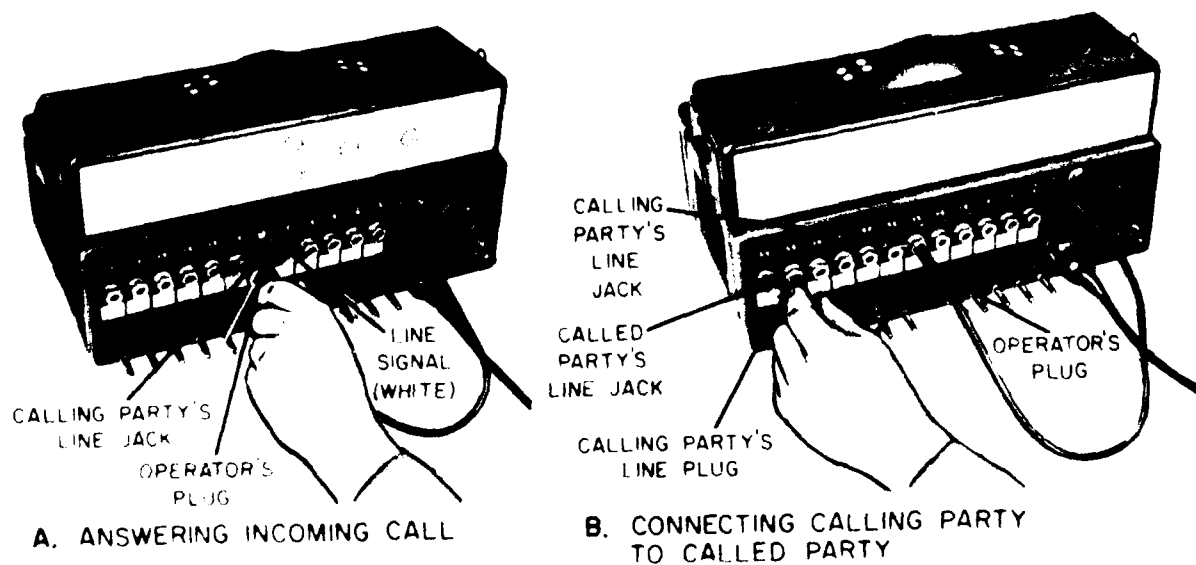
If the calling party disconnects before the called party answers or before the conversation is completed, you can ring back the calling party (fig. 8-17, view D). You do this by removing the plug of the operator's cord from the operator's jack on the operator's pack and inserting it into the call party's jack. Operate the RING BACK-PWR RING FWD switch to the RING BACK, turn the hand-ringing generator rapidly approximately 10 turns. Remove the operator's plug from the calling party's jack and insert it into the operator's jack when both parties answer.

If the called party disconnects before the conversation is completed, remove the plug of the operator's cord from the operator's pack and insert it into the jack of the calling party's line jack. Operate the hand-ringing generator rapidly about 10 turns. Remove the plug of the operator's cord from the jack of the calling party's line jack and insert it into the operator's jack on the operator's pack after both parties have answered.



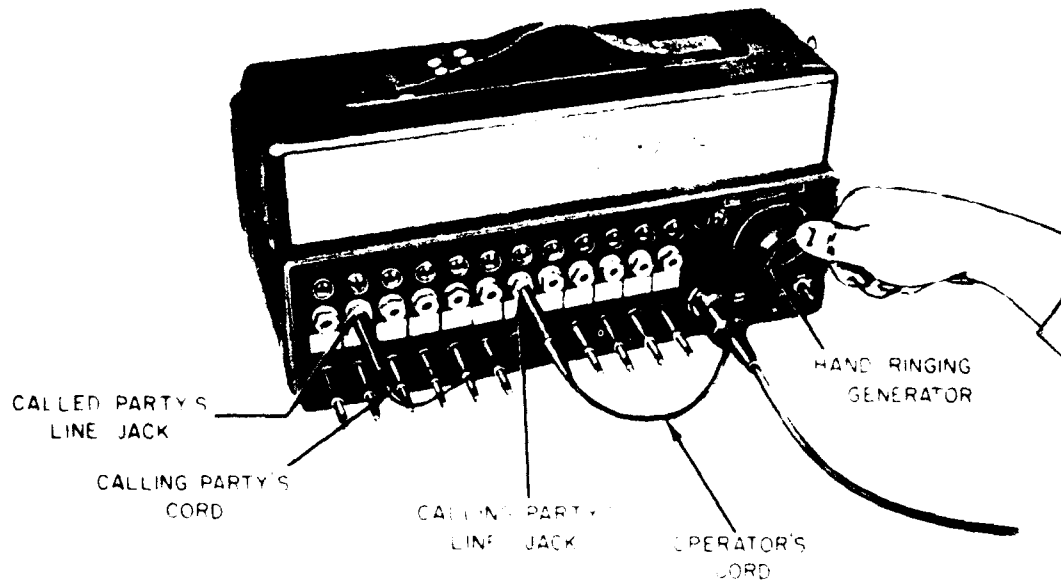
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Figure 8-16.—Operating positions of the push-to-talk switch.

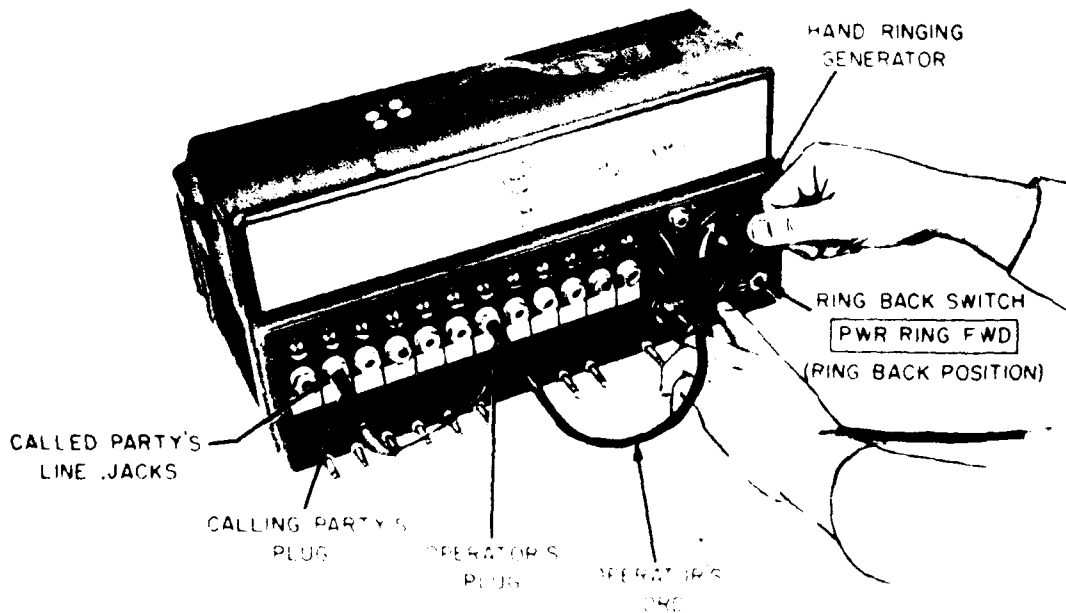


187.74.1

Figure 8-17.—Steps required to connect local calls through the SB-22/PT switchboard.



C. SIGNALING CALLED PARTY



D. RINGING BACK CALLING PARTY

187.74.2

Figure 8-17.—Steps required to connect local calls through the SB-22/PT switchboard—Continued.

If you must leave the switchboard, move the visual and audible alarm switch (fig. 8-10) from VIS to AUD. The alarm is silent on VIS, but audible on AUD. When the alarm is not required, place the VIS/AUD switch to the OFF position.

To operate your switchboard in the dark, pull out on the lamp cap to turn the lamp on. Remember, though, when the lamp is lighting the switchboard, the night alarm cannot be used at the same time.

STACKING OF TWO SWITCHBOARDS

To serve more than 12 but fewer than 30 lines, stack the 12-line switchboards. Remove the

operator's pack from the switchboard and install five line packs in the empty space. Place this modified switchboard on top of a normally equipped switchboard. Use two jumpers to connect the two switchboards. One jumper must be connected to the NA binding posts of both switchboards, and the other jumper must be connected to the GND binding posts of both switchboards. Be sure that the jumpers pass through the slot at the side of each switchboard. Only one set of batteries is required to serve both switchboards; remove the battery case from the one containing the 17 line packs (from which the operator's pack has been removed). The field telephones can then be connected. A maximum of 29 lines can be served with this arrangement as shown in figure 8-18.

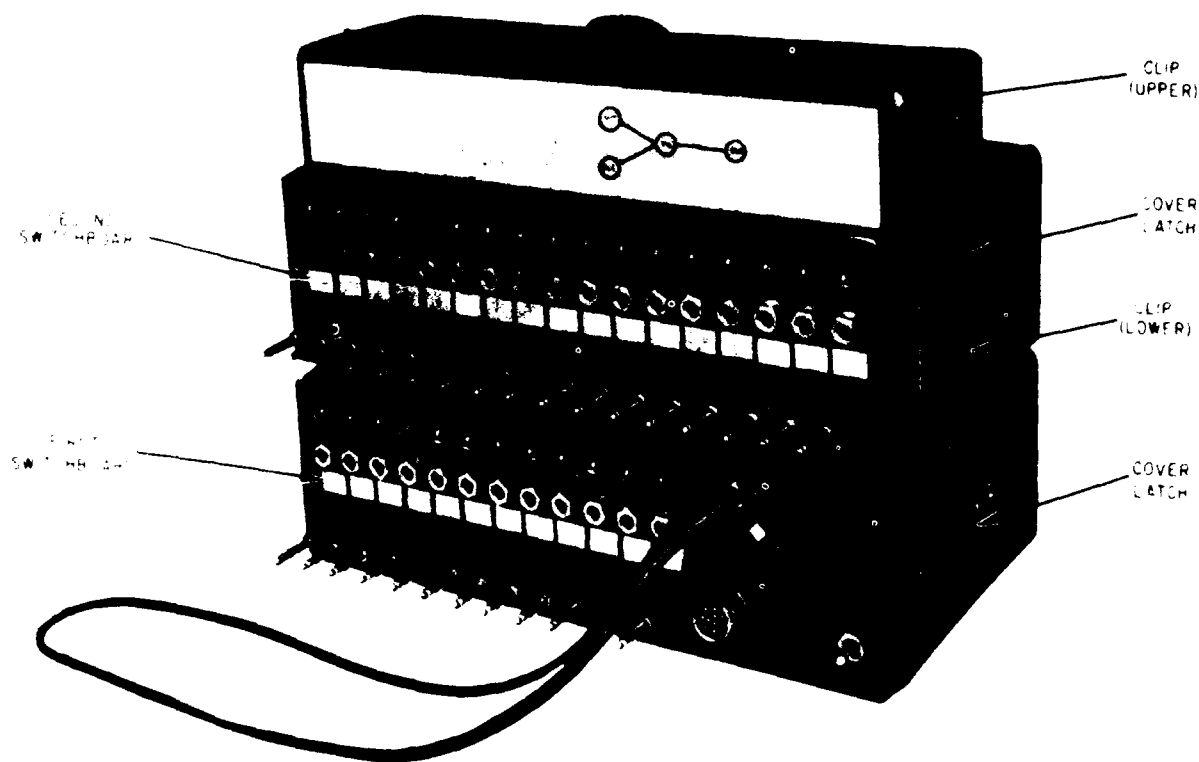


Figure 8-18.—Installation arrangement for two switchboards.

187.191

RADIO AND TELEPHONE PROCEDURES

Even though your primary duties are those of a rifleman, machine gunner, or mortarman, you may be called upon to pick up a radio to pass some valuable information to one of the platoons or to the battalion headquarters.

This section will supply you with enough knowledge of the correct radio and telephone procedures to allow you to operate any voice radio equipment found in the SEABEE battalion.

The following terms are defined so you will have a better understanding of the explanations in the paragraphs of the following section.

1. **TRANSMISSION:** A communication sent by one station and intended for reception by another station or stations.

2. **ANSWER:** A transmission made by a station called in response to the call received.

3. **CALL SIGN:** A call sign is a word, or a combination of words, intended for transmission by voice means and identifies the command, unit, or authority of the radio station.

4. **NET CALL SIGN:** The collective call sign that represents all the radio stations operating together on a particular radio net.

5. **NET CONTROL STATION:** A radio station appointed by higher authority to direct and control the operation and flow of all traffic handled on the radio net.

6. **PROWORD:** A pronounceable word or phrase that has been assigned a meaning to speed up message handling on radio nets that employ radio and telephone. A list of prowords and their meanings is given later in this section.

7. **ABBREVIATED PLAINDRESS MESSAGE:** A message that has certain elements of the message heading omitted for speed of handling. Any one or all of the following may be omitted: precedence, date, date-time group, group count.

8. **RECEIPT:** A communication sent by the receiving operator indicating that the message or other transmission has been satisfactorily received.

9. **ACKNOWLEDGMENT:** A separate message originated by the addressee that will inform the originator that his message has been received and is understood.

PHONETIC ALPHABET AND NUMERALS

When it is necessary to identify any letter of the alphabet, the standard phonetic alphabet is used. This prevents the possibility of the receiving operator copying your words or groups of words incorrectly. B's, P's, T's, and other letters that sound alike can be confusing when heard on radio telephone nets. Learn the phonetic alphabet listed below and the proper pronunciation as spoken over radio nets.

<u>Letter</u>	<u>Phonetic equivalent</u>	<u>Pronounced as</u>
A	ALFA	AL fah
B	BRAVO	BRAH voh
C	CHARLIE	CHAR lee or SHAR lee
D	DELTA	DELL tah
E	ECHO	ECK oh
F	FOXTROT	FOKS trot
G	GOLF	GOLF
H	HOTEL	hoh TELL
I	INDIA	IN dee ah
J	JULIETT	JEW lee ett
K	KILO	KEY loh
L	LIMA	LEE mah
M	MIKE	MIKE
N	NOVEMBER	no VEM ber
O	OSCAR	OSS cah
P	PAPA	pah PAH
Q	QUEBEC	keh BECK
R	ROMEO	ROW me oh
S	SIERRA	see AIR rah
T	TANGO	TANG go
U	UNIFORM	YOU nee form
V	VICTOR	VIK tah
W	WHISKEY	WISS key
X	XRAY	ECKS ray
Y	YANKEE	YANG key
Z	ZULU	ZOO loo

USE OF THE PROWORD "I SPELL."

Difficult words or groups within the text of the message may be spelled out using the phonetic alphabet and will be started with the proword "I SPELL."

EXAMPLE: CATENARY. . . . "I SPELL" CHARLIE, ALFA, TANGO, ECHO, NOVEMBER, ALFA, ROMEO, YANKEE. . . CATE-NARY. Where the text is composed of easily pronounced words, they can be spoken.

USE OF PROWORD "FIGURES." In order to distinguish numerals from words similarly pronounced, the proword "FIGURES" may be used before numbers.

TRANSMITTING NUMERALS. When numerals are transmitted by radiotelephone, the following rules for their pronunciation should be used.

<u>Numerals</u>	<u>Spoken as</u>
0	Zero
1	Wun
2	Too
3	Thuh-ree
4	Fo-wer
5	Fi-yiv
6	Six
7	Seven
8	Ate
9	NIN er

TRANSMITTING NUMBERS. Numbers are transmitted digit by digit except that exact multiples of hundreds and thousands may be spoken as such. However, there are special cases when the normal pronunciation of numerals is as follows:

<u>Number</u>	<u>Spoken as</u>
44	Fo-wer fo-wer
90	Niner zero
136	Wun thuh-ree six
500	Fi-yiv hun-dred
1478	Wun fo-wer seven ate
7000	Seven thow-zand
16000	Wun six thow-zand
16400	Wun six fo-wer hun-dred
812681	Ate wun two six ate wun

PROWORDS

The following prowords and their meanings, authorized for general use, are those that are commonly used on the SEABEE battalion radio nets.

ALL AFTER: The portion of the message to which I have reference is all that which follows

ALL BEFORE: The portion of the message to which I have reference is all that which precedes

BREAK: I hereby indicate the separation of the text from other portions of the message.

CORRECTION: An error has been made in this transmission. I will continue with the last word I transmitted correctly.

DISREGARD THIS TRANSMISSION: The transmission is an error. Disregard it. This proword shall not be used to cancel any message that has been completely transmitted and for which receipt or acknowledgement has been received.

DO NOT ANSWER: Stations called are not to answer this radio call, receipt for this message, or otherwise transmit in connection with this transmission. When this proword is employed, the transmission shall be ended with the proword OUT.

EXEMPT: The addressee call signs immediately following are exempted from the collective call or net call.

FIGURES: Numerals or numbers to follow.

FROM: The originator of this message is indicated by the call sign immediately following.

INFO: To addressee immediately following are addressed for information.

ISAY AGAIN: I am repeating transmission or portion indicated.

I SPELL: I shall spell the next word phonetically.

MESSAGE FOLLOWS: A message that requires recording is about to follow. Transmitted immediately after the radio call. (This proword is not used on nets primarily employed for conveying messages. It is intended for use when messages are passed on tactical or reporting nets.)

NUMBER: Station serial number of messages sent. Normally run in sequence for one 24-hour period.

OUT: This is the end of my transmission to you and no answer is required or expected.

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OVER: This is the end of my transmission to you and a response is necessary. Go ahead; transmit.

PRECEDENCE PROWORDS: These are four precedence designations that are used in handling radio messages. These precedence prowords indicate the order in which one message will be handled relative to other messages. The originator of the message assigns the precedence of the message. The precedence prowords in order of their importance are as follows:

1. FLASH
2. OPERATIONAL IMMEDIATE
3. PRIORITY
4. ROUTINE

READ BACK: Repeat this entire transmission back to me exactly as you received it.

RELAY: Transmit this message to all the addressees immediately following.

ROGER: I have received your last transmission satisfactorily.

SAY AGAIN: Repeat all of your last transmission. Followed by identification data means "Repeat portion indicated."

THIS IS: This transmission is from the station whose call sign immediately follows.

TO: The addressees whose call signs immediately follow are to take action on this message.

WAIT: I must pause for a few seconds.

WAIT OUT: I must pause longer than a few seconds.

WILCO: I have received your message, understand it, and will comply. To be used only by the addressee. Since the meaning of ROGER is included in that of WILCO, the two prowords are never used together.

WORD AFTER: The word of the message to which I have reference is that which follows

WORD BEFORE: The word of the message to which I have reference is that which precedes

WORDS TWICE: Communication is difficult. Transmit (transmitting) each phrase (or each code group) twice. This proword may be used as an order, request, or as information.

WRONG: Your last transmission was incorrect. The correct version is _____.

FIELD MESSAGE FORMAT AND PREPARATION

The field message book, NAVMC 694, is primarily and extensively used in a tactical environment. Each book contains a hundred message forms that are self-carboning for easy duplication. A sample message and instructions for preparing field messages are depicted in figure 8-19. Spaces are provided at the bottom of the form to record the time of receipt (TOR) and time of delivery (TOD). The form is also a convenient reference when records are necessary.

TACTICAL MESSAGE FORMATS

The different types of reports and their content are published in the battalion's operations order (OPORD). On a patrol or in an emergency, you can't always readily refer to the OPORD. Providing inadequate information, or even worse no information, about tactical situations can be harmful and can prevent a proper response. Always depict who, what, when, where, and how, if known; then, follow it up later as more information becomes available. The rule of thumb for reporting tactical information is to remember the following acronym **SALUTE**.

Size of enemy unit
Activity of enemy unit
Location of enemy unit(s)
Uniform worn by enemy
Time of each activity noted
Equipment used or carried by enemy

SECURITY

An important rule of communication is to remember that the enemy is always listening. Therefore, we must always use correct security procedures when communicating classified information. Even seemingly unimportant unclassified information can be a valuable source of intelligence to the enemy. So certain information is prohibited from being transmitted in the clear. This type of information is known as Essential Elements of Friendly Information (EEFI).

The EEFI system is actually a code that allows us to notify one another of a security breach that

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PROTECTOR INSERT Place this under the last copy of each message written.			
SAMPLE MESSAGE			
Z	O	P	R
DTG (COMM. USE)		FM:	
080855 W Aug 80		3D MAR	
TO: 3/3			
BT	TOPSEC	SECRET	CONF
UNCLAS			
CONTINUE ATTACK AT 0930. REPORT WHEN OBJECTIVE IS CONSOLIDATED.			
_____ _____ _____ _____ _____			
RELEASING OFFICER'S SIGNATURE <i>G. D. Barrett</i>			TOR/TOD 3/3/4125 HHE 80/0901 W
PAGE 1 of 1			BT

INSTRUCTIONS FOR PREPARING FIELD MESSAGES

1. DRAFTER:

- a. Place the protector insert under the message blanks to limit the number of copies produced. Retain one copy in the book as a file copy. Classify cover in accordance with contents.
- b. Use BLOCK CAPITAL letters for all entries.
- c. To assign precedence, circle the appropriate letter using the table on front cover as a guide.
- d. Print organization originating message in "FM" space. (DO NOT USE CALL SIGN.)
- e. Print organization(s) for whom the message is intended in the "TO" space. (DO NOT USE CALL SIGNS.)
- f. To assign classification, circle the appropriate classification printed on the message blank.
- g. DO NOT USE ABBREVIATIONS IN TEXT. (Abbreviations lengthen transmit time.) Be brief. Use simple words. Use "Ø" for all zeros. Number pages in appropriate space.
- h. Drafter is responsible for all message drafting functions to include the use of brevity codes and numeral/letter encryption.

2. RELEASING OFFICER:

- a. Ensure drafter functions are completed.
- b. Sign appropriate space if message is approved. (First page only.)

3. OPERATOR:

- a. Assign local-time date-time-group, "DTG", if required by unit SOP.
- b. Convert "FM" and "TO" entries to call signs. (FOR UNSECURE VOICE TRANSMISSIONS ONLY.)
- c. Fill in TOR:TOD information, as appropriate.

TOR TIME OPERATOR INITIAL FREQUENCY	TOD STATION CALLED FREQUENCY OPERATOR INITIAL TIME
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Figure 8-19.—Sample message and instructions.

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has occurred over a circuit. The term used to identify a violation of this type is **BEADWINDOW** (example: Beadwindow Three). This indicates to the transmitting station that he has violated security. The only response to a **BEADWINDOW** is **ROGER OUT**. All violations must be reported. Beadwindow procedures are incorporated into the OPORD. They are given below. Others can be added at the commander's discretion.

BEADWINDOW CODES:

- Position—01 Friendly or enemy position, movement or intended movement: position, course, speed, altitude or destination of any air, sea, or ground element unit or force.
- Capabilities—02 Friendly or enemy capabilities or limitations: force composition or identity, capabilities, limitations or significant casualties to special equipment, weapon systems, sensors, units, or personnel. Percentages of fuel or ammunition remaining.
- Operations—03 Friendly or enemy operations, intentions, progress or results: operational or logistic intentions, assault objectives, mission participants, flying programs, mission situation reports, results of friendly or enemy operations.
- Electronic Warfare—04 Friendly or enemy electronic warfare emission control (EW/EMCON) intentions, progress, or results: intention to employ electronic countermeasures (ECM), results of friendly or enemy electronic counter-countermeasures (ECCM), results of electronic warfare support measures (ESM), present or intended EMCON policy, equipment affected by EMCON policy.

- Personnel—05 Friendly or enemy key personnel: movement or identity of friendly or enemy flag officers, distinguished visitors, unit commanders, movements of key maintenance personnel indicating equipment limitations.

- COMSEC—06 Friendly or enemy communications security (COMSEC) locations: linkage of codes or code words with plain language, compromise of changing frequencies or linkage with line numbers, circuit designators: linkage of changing call signs with previous call signs or units, compromise of encrypted or classified call signs, incorrect authentication procedure.

- Wrong Circuit—07 Inappropriate transmission: information requested, transmitted or about to be transmitted that should not be passed on the subject circuit because it either requires greater security protection or is not appropriate to the purpose for which the circuit is provided.

MESSENGERS

Messenger service is the backbone of the rifle company communication system. It is a backup for both the wire and radio systems. Wire lines may be cut by enemy fire or by enemy infiltration. Radio communication is unsecure and should not be relied upon as the only means of communication. Therefore the foot runner is the most dependable. The manner in which messengers are used depends on the tactical situation. Normally, a messenger from each rifle platoon is sent to the company command post. Then with each displacement, he is replaced with a new

messenger. This provides the company commander with a runner who knows the exact location of his parent rifle platoon. One company messenger is located in the battalion command post and is replaced by another upon each company displacement.

Communication by Messenger

When time permits, a message should be written; however, oral messages are often necessary. A complete message must answer the questions of what, when, and where; but a message should be made as brief as possible, omitting any words that do not add to the meaning.

A written message should be printed plain in block letters; individual letters contained in the message should be spelled out using the phonetic alphabet (as, Zulu for letter Z). The name of the command authorizing the message and the name of the command to which it is being sent must be written in the message. The actual writer of the message must sign his name and rank or rate.

Messenger Training

A combat messenger must be especially trained in the following skills:

1. How to deliver messages, either oral or written
2. How to travel over various kinds of terrain at prescribed speeds
3. How to use a compass for orientation and direction
4. How to read maps
5. How to select routes that provide the best cover and concealment
6. How to recognize units and command posts with which communication is maintained

Messenger Briefing

A messenger must be briefed with the following information:

1. The name and location of the post, unit, or person to whom the message is to be delivered
2. The route to be followed
3. The danger points to be avoided
4. The speed required
5. Whether or not an answer is required
6. Where to report in case the message cannot be delivered
7. The contents of the message if the situation warrants
8. Special instructions if any

For an oral message, the messenger must be required to repeat the message to the sender, to memorize it, and to deliver it word-for-word.

COMBAT SIGNALS

Oral (that is, voice) communication is often difficult or impossible under combat conditions. At times complete silence must be maintained. Under such conditions, signals are used to transmit commands or information. Three types of combat signals are used:

1. Whistle signals
2. Special signals
3. Arm and hand signals

Understanding combat signals is important for a fire team. Make sure you become thoroughly familiar with each signal described in this section. Bear in mind, too, that practice in the use of combat signals is essential if the signals are to be used effectively.

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Whistle Signals

As a rule, only three whistle signals are used, since a large variety could cause confusion. The following three are commonly used whistle signals:

1. **ATTENTION TO ORDERS** is indicated by one short blast on the whistle. It is used to fix the attention of unit members on the unit leader who gives the signal and means that other signals, orders, or commands will follow.

2. **CEASE FIRING** is indicated by one long blast on the whistle. This signal is verified immediately by an arm and hand signal or by some other means.

3. **HOSTILE AIRCRAFT** or **MECHANIZED VEHICLE** is indicated by three long blasts repeated several times.

Special Signals

Special signals cover all the special methods and devices used to transmit commands or information. Rifle shots or automatic rifle bursts may be used if the entire command knows their meanings and the sound is distinct enough to be heard easily. A squad leader operating at night may find the use of raps on his helmet or rifle effective. Signals must be determined and practiced before they are used. Various pyrotechnic and smoke signals may be chosen as signals to attack, withdraw, mark front lines, or indicate targets.

Certain special signals are standard for all branches of the armed forces to indicate the approach or presence of hostile aircraft or mechanized vehicles. They are as follows:

1. Three long blasts of a whistle, vehicular horn, siren, or Klaxon repeated several times.

2. Three equally spaced shots with rifle or pistol.

3. Three short bursts of fire from automatic small arms.

In daylight, the individual giving the signal should point toward the danger; at night, the alarm should be supplemented by voice warning to indicate the direction—for example, **ENEMY TANKS APPROACHING BY THE NORTH ROAD** or **HOSTILE AIRCRAFT APPROACHING FROM THE WEST**.

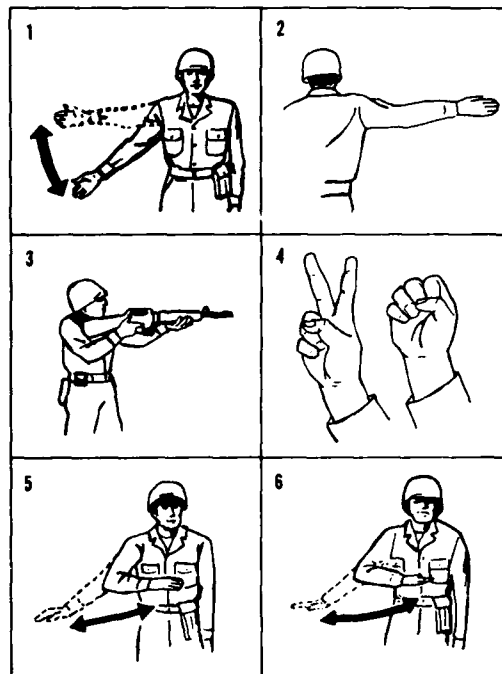
Unit leaders should devise special signals whenever they appear to be useful in a particular situation. Before devising a special signal for the unit, the leaders should make certain that higher authority has not assigned some other meaning to the same signal.

Combat Arm and Hand Signals

Signals are used to transmit commands or information when voice communication is difficult or impossible or when silence must be maintained. Leaders should repeat signals to their units whenever necessary to make sure of prompt and correct execution of orders. Leaders giving arm and hand signals should remember that these are an order of command. The signal is given smartly. Leaders have to be aware of their location to make sure the signal can be seen by the unit. If a movement is to be executed by a particular unit or units, a signal appointing the unit or units will precede the signal for the movement. If a movement is to be executed in unison, the signal for the movement should be followed by the signal **READY**. After the ready signal is acknowledged, the movement is executed at the same time that the arm is lowered. Signals requiring a change of direction have no connection with the direction in which the person giving the signal is facing. The direction of movement is shown by the direction in which the arm of the signaler points. Standard arm and hand signals are explained in figure 8-20.

In modern warfare, a helicopter is a common sight during combat. All personnel should be familiar with hand signals that assist helicopter

1. **DECREASE SPEED**
EXTEND THE ARM HORIZONTALLY SIDeward, PALM TO THE FRONT, AND WAVE ARM DOWNWARD SEVERAL TIMES, KEEPING THE ARM STRAIGHT. ARM DOES NOT MOVE ABOVE THE HORIZONTAL.
2. **CHANGE DIRECTION; OR COLUMN (RIGHT OR LEFT)**
EXTEND ARM HORIZONTALLY TO THE SIDE, PALM TO THE FRONT.
3. **ENEMY IN SIGHT**
HOLD THE RIFLE HORIZONTALLY, WITH THE STOCK IN THE SHOULDER, THE MUZZLE POINTING IN THE DIRECTION OF THE ENEMY.
4. **RANGE**
EXTEND THE ARM FULLY TOWARD THE LEADER OR MEN FOR WHOM THE SIGNAL IS INTENDED WITH FIST CLOSED. OPEN THE FIST EXPOSING ONE FINGER FOR EACH 100 YARDS OF RANGE.
5. **COMMENCE FIRING**
EXTEND THE ARM IN FRONT OF THE BODY, HIP HIGH, PALM DOWN, AND MOVE IT THROUGH A WIDE HORIZONTAL ARC SEVERAL TIMES.
6. **FIRE FASTER**
EXECUTE RAPIDLY THE SIGNAL "COMMENCE FIRING." FOR MACHINEGUNS, A CHANGE TO THE NEXT HIGHER RATE OF FIRE IS PRESCRIBED.



7. **FIRE SLOWER**
EXECUTE SLOWLY THE SIGNAL "COMMENCE FIRING." FOR MACHINEGUNS, A CHANGE TO THE NEXT LOWER RATE OF FIRE IS REQUIRED.
8. **CEASE FIRING**
RAISE THE HAND IN FRONT OF THE FOREHEAD, PALM TO THE FRONT, AND SWING THE HAND AND FOREARM UP AND DOWN SEVERAL TIMES IN FRONT OF THE FACE.
9. **ASSEMBLE**
RAISE THE HAND VERTICALLY TO THE FULL EXTENT OF THE ARM, FINGERS EXTENDED AND JOINED, PALM TO THE FRONT, AND WAVE IN LARGE HORIZONTAL CIRCLES WITH THE ARM AND HAND.
10. **FORM COLUMN**
RAISE EITHER ARM TO THE VERTICAL POSITION. DROP THE ARM TO THE REAR, DESCRIBING COMPLETE CIRCLES IN A VERTICAL PLANE PARALLEL TO THE BODY. THE SIGNAL MAY BE USED TO INDICATE EITHER A TROOP OR VEHICULAR COLUMN.

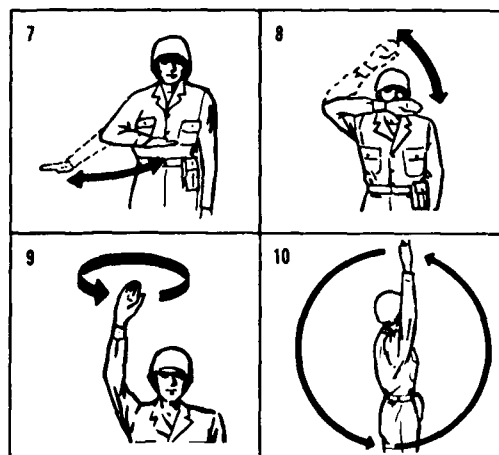


Figure 8-20.—Combat arm and hand signals.

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11. **ARE YOU READY?**
EXTEND THE ARM TOWARD THE LEADER FOR WHOM THE SIGNAL IS INTENDED, HAND RAISED, FINGERS EXTENDED AND JOINED, THEN RAISE ARM SLIGHTLY ABOVE HORIZONTAL, PALM FACING OUTWARD.
12. **I AM READY**
EXECUTE THE SIGNAL ARE YOU READY.
13. **SHIFT**
RAISE THE HAND THAT IS ON THE SIDE TOWARD THE NEW DIRECTION ACROSS THE BODY, PALM TO THE FRONT, THEN SWING THE ARM IN A HORIZONTAL ARC, EXTENDING ARM AND HAND TO POINT IN THE NEW DIRECTION.
14. **ECHELON RIGHT (LEFT)**
FACE THE UNIT(S) BEING SIGNALLED AND EXTEND ONE ARM 45° ABOVE AND THE OTHER ARM 45° BELOW THE HORIZONTAL, PALMS TO THE FRONT. THE LOWER ARM INDICATES THE DIRECTION OF ECHELON. SUPPLEMENTARY COMMANDS MAY BE GIVEN TO ENSURE PROMPT AND PROPER EXECUTION.
15. **AS SKIRMISHERS (FIRE TEAM);
LINE FORMATION (SQUAD)**
RAISE BOTH ARMS LATERALLY UNTIL HORIZONTAL, ARMS AND HANDS EXTENDED, PALMS DOWN. IF IT IS NECESSARY TO INDICATE A DIRECTION, MOVE IN THE DESIRED DIRECTION AT THE SAME TIME.
16. **WEDGE**
EXTEND BOTH ARMS DOWNWARD AND TO THE SIDE AT AN ANGLE OF 45° BELOW THE HORIZONTAL, PALMS TO THE FRONT.
17. **VEE**
EXTEND ARMS AT AN ANGLE OF 45° ABOVE THE HORIZONTAL FORMING THE LETTER "V" WITH ARMS AND TORSO.
18. **FIRE TEAM**
THE RIGHT ARM SHOULD BE PLACED DIAGONALLY ACROSS THE CHEST.
19. **SQUAD**
EXTEND THE HAND AND ARM TOWARD THE SQUAD LEADER, PALM OF THE HAND DOWN, DISTINCTLY MOVE THE HAND UP AND DOWN SEVERAL TIMES FROM THE WRIST, HOLDING THE ARM STEADY.
20. **PLATOON**
EXTEND BOTH ARMS FORWARD, PALMS OF THE HANDS DOWN, TOWARD THE LEADER(S) OR UNIT(S) FOR WHOM THE SIGNAL IS INTENDED AND DESCRIBE LARGE VERTICAL CIRCLES WITH HANDS.
21. **CLOSE UP**
START SIGNAL WITH BOTH ARMS EXTENDED SIDEWARD, PALMS FORWARD, AND BRING PALMS TOGETHER IN FRONT OF THE BODY MOMENTARILY. WHEN REPETITION OF THIS SIGNAL IS NECESSARY, THE ARMS ARE RETURNED TO THE STARTING POSITION BY MOVEMENT ALONG THE FRONT OF THE BODY.
22. **OPEN UP, EXTEND**
START SIGNAL WITH ARMS EXTENDED IN FRONT OF THE BODY, PALMS TOGETHER, AND BRING ARMS TO THE HORIZONTAL POSITION AT THE SIDES, PALMS FORWARD. WHEN REPETITION OF THIS SIGNAL IS NECESSARY, THE ARMS ARE RETURNED ALONG THE FRONT OF THE BODY TO THE STARTING POSITION AND THE SIGNAL IS REPEATED UNTIL UNDERSTOOD.

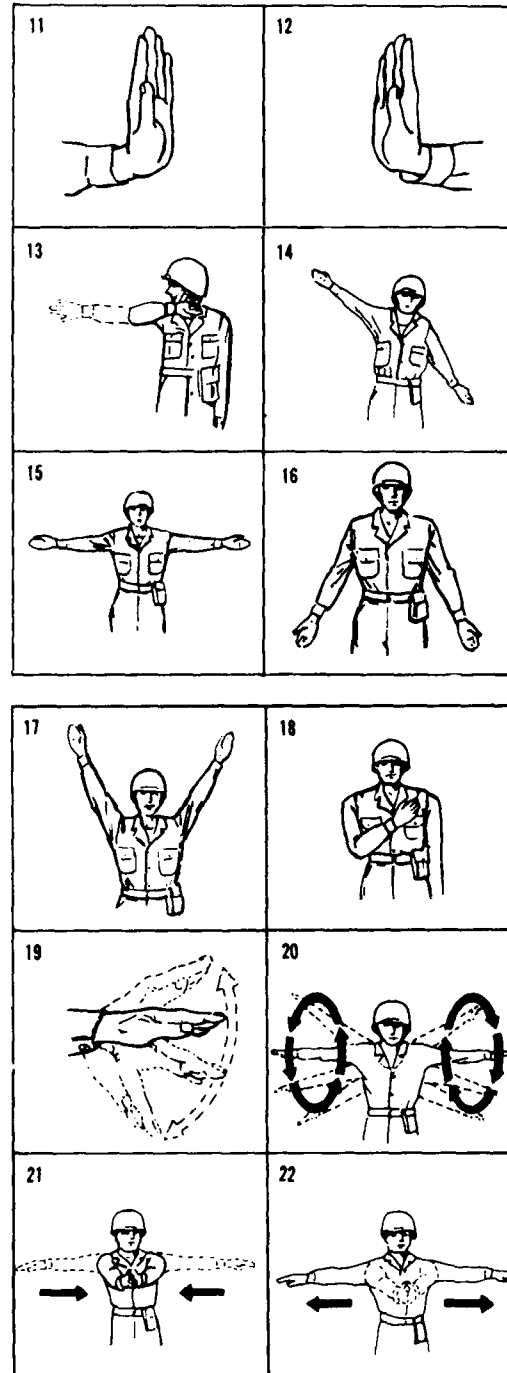


Figure 8-20.—Combat arm and hand signals—Continued.

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23. DISPERSE

EXTEND EITHER ARM VERTICALLY OVERHEAD; WAVE THE HAND AND ARM TO THE FRONT, LEFT, RIGHT, AND REAR, THE PALM TOWARD THE DIRECTION OF EACH MOVEMENT.

24. I DO NOT UNDERSTAND

FACE TOWARD SOURCE OF SIGNAL; RAISE BOTH ARMS SIDWARDS TO THE HORIZONTAL AT HIP LEVEL, BEND BOTH ARMS AT ELBOWS, PALMS UP, AND SHRUG SHOULDERS IN THE MANNER OF THE UNIVERSAL "I DUNNO."

25. FORWARD; ADVANCE; TO THE RIGHT (LEFT); TO THE REAR (USED WHEN STARTING FROM A HALT)

FACE AND MOVE IN THE DESIRED DIRECTION OF MARCH; AT THE SAME TIME EXTEND THE ARM HORIZONTALLY TO THE REAR; THEN SWING IT OVERHEAD AND FORWARD IN THE DIRECTION OF MOVEMENT UNTIL IT IS HORIZONTAL, PALM DOWN.

26. HALT

CARRY THE HAND TO THE SHOULDER, PALM TO THE FRONT; THEN THRUST THE HAND UPWARD VERTICALLY TO THE FULL EXTENT OF THE ARM AND HOLD IT IN THAT POSITION UNTIL THE SIGNAL IS UNDERSTOOD.

27. FREEZE

MAKE THE SIGNAL FOR "HALT" AND MAKE A FIST WITH THE HAND.

28. DOWN; TAKE COVER

EXTEND ARM SIDEWARD AT AN ANGLE OF 45° ABOVE HORIZONTAL, PALM DOWN, AND LOWER IT TO SIDE. BOTH ARMS MAY BE USED IN GIVING THIS SIGNAL. REPEAT UNTIL UNDERSTOOD.

29. INCREASE SPEED; DOUBLE TIME

CARRY THE HAND TO THE SHOULDER, FIST CLOSED; RAPIDLY THRUST THE FIST UPWARD VERTICALLY TO THE FULL EXTENT OF THE ARM AND BACK TO THE SHOULDER SEVERAL TIMES. THIS SIGNAL IS ALSO USED TO INCREASE GAIT OR SPEED.

30. HASTY AMBUSH RIGHT (LEFT)

RAISE FIST TO SHOULDER LEVEL AND THRUST IT SEVERAL TIMES IN THE DESIRED DIRECTION.

31. RALLY POINT

TOUCH THE BELT BUCKLE WITH ONE HAND AND THEN POINT TO THE GROUND.

32. OBJECTIVE RALLY POINT

TOUCH THE BELT BUCKLE WITH ONE HAND, POINT TO THE GROUND, AND MAKE A CIRCULAR MOTION WITH THE HAND.

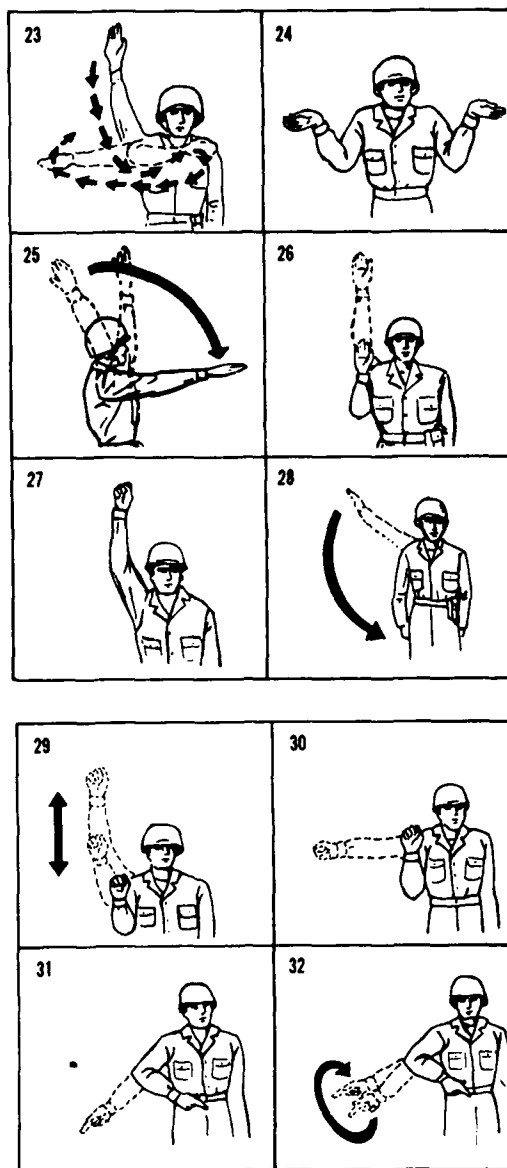


Figure 8-20.—Combat arm and hand signals—Continued.

pilots in landing. Use the following hand signals to guide a pilot.

1. To Direct Helicopter Forward. Extend your arms and hands above your head with your palms facing away from the helicopter. Move your hands in a manner that simulates a pulling motion. (See fig. 8-21.)

2. To Direct Helicopter Backward. Extend your arms and hands above your head with your palms facing toward the helicopter. Move your hands in a manner that simulates a pushing motion. (See fig. 8-22.)

3. To Direct Helicopter Sideways. Extend your arms and palms out to your side with your palms facing the direction that the helicopter

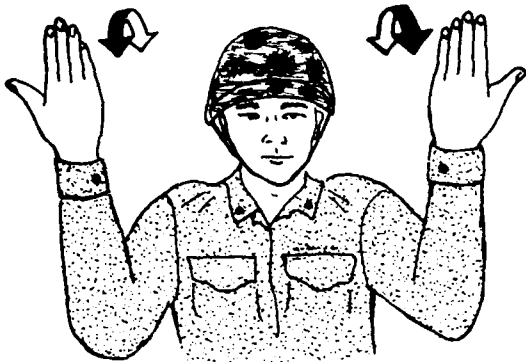


Figure 8-21.—To direct helicopter forward.

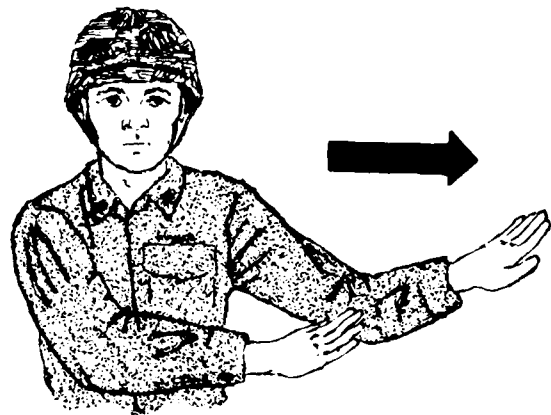


Figure 8-23.—To direct helicopter sideways.

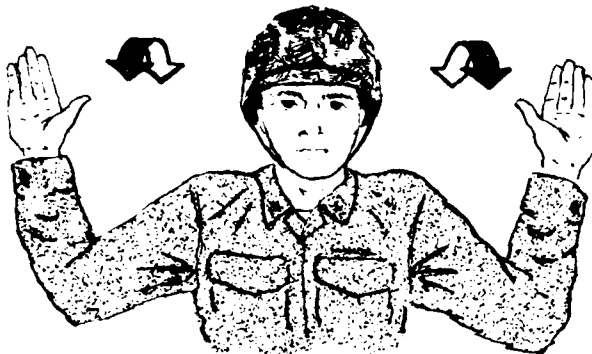


Figure 8-22.—To direct helicopter backward.

should move. Move your hands in a manner that simulates pushing the helicopter in the desired direction. (See fig. 8-23.)

4. To Direct Helicopter to Land. Bend your arms at the elbows with the lower arms held parallel to the ground at waist level. Palms are facing downward parallel to the ground, and forearms are moving to simulate a downward pushing motion. (See fig. 8-24.)

5. To Direct Helicopter to Takeoff. Extend both hands above your head with fists clenched and thumbs raised. (See fig. 8-25.)

6. To Direct Helicopter to Hold Its Present Position. Cross your forearms above your head with both fists clenched. (See fig. 8-26.)

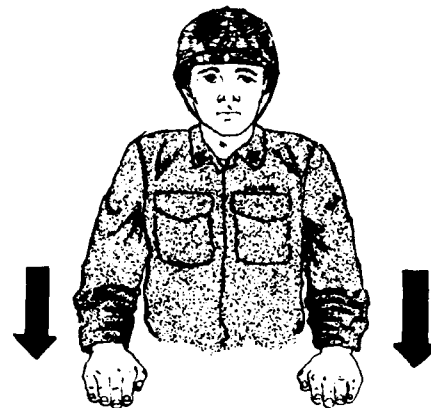


Figure 8-24.—To direct helicopter to land.



Figure 8-25.—To direct helicopter to takeoff.



Figure 8-26.—To direct helicopter to hold its present position.

WRITTEN ORDERS

An NMCB's standard operating procedures (SOPs) are a set of written orders issued by the battalion commander. They cover the battalion administrative and tactical operations that lend themselves to a definite or a standardized procedure without any loss of effectiveness. The uses of SOPs are

- to simplify the preparation and transmission of orders;
- to simplify and perfect the training of the troops;
- to facilitate operations;
- to minimize confusion and errors; and
- to promote understanding and teamwork between the battalion commander and his subordinates.

Written orders are prepared to cover battalion operations and are available to all personnel for

guidance in the absence of other instructions or orders. The details contained in the SOPs depend on the desires of the commander and the direction of the higher command. However SOPs must contain all information needed to serve as a guide for new personnel assigned to the battalion.

Operation Orders (OPORD)

An operation order (OPORD) puts an operation plan into effect. An OPERATION PLAN (OPLAN) is a detailed statement of the course of action to be followed to accomplish a future mission. (See fig. 8-27.) An OPORD is the formal statement issued by a senior commander to subordinate commanders to outline the coordinated execution of a future operation in the field.

In five paragraphs, OPLANs and OPORDs detail the complete information and orders necessary to carry out the decision of the commander. They are written so subordinate units and agencies will have a thorough understanding of the part each is to play in the operations.

OPORDs may be oral, dictated, or in written form. The most important determining factor of the form and method of issuing an OPORD is the time available for its preparation and distribution. An order should reach its destination in enough time to avoid halting troops while they wait for further instructions. Even the lowest subordinate commander needs time to reconnoiter, place his troops in position, make other necessary arrangements, and issue his own orders prior to the hour set for beginning the action.

Oral and dictated orders are similar because both are spoken orders. When oral orders are issued, notes are made by the persons receiving them. Dictated orders are recorded verbatim by the receiver. A complete copy of the order or notes are kept by the staff of the issuing commander.

Written orders may be in a message or another convenient form. The use of accompanying maps, photomaps, overlays, and tables saves time and words and minimizes errors. In many cases an entire OPORD can be placed on a map or overlay.

Format for OPORD

The **HEADING** contains the security classification, a statement about changes from

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	Copy Number Issuing Unit Place of Issue Date Time Group of Issue
CLASSIFICATION	
OPERATION ORDER NMCB ZERO 0-70	
TIME ZONE _____	
TASK ORGANIZATION: NMCB ZERO (Detail Zero, etc.)	
REFERENCES: (a) COMCBPAC/LANT OPORD _____ (b) COMCBPAC/LANT INSTRUCTION 3121.1 series (c) etc.	
1. SITUATION: A brief statement as to why the detail is required to deploy to a given area. a. Enemy Forces b. Friendly Forces c. Attachments and detachments	
2. MISSION: A brief statement of the construction or the disaster recovery mission to be accomplished by the unit executing the operation, or the combat defense role.	
3. EXECUTION: a. What, When, Who, and Where b. Concept of Operations (cite Annex) c. Coordinating instructions (1) Advance Party	
4. ADMINISTRATION AND LOGISTICS: a. Cite Annexes	
5. COMMAND AND COMMUNICATIONS: a. Operations of communications b. Location of command posts c. Axis of communication	
	BY COMMAND OF _____ SIGNED _____ RANK AND SERVICE
ANNEXES: (as applicable) B Concept of Operations C Intelligence D Training E Construction Tasks F Communications I Civic Action O Logistics P Admin and Personnel R Reports S Safety T Medical and Dental U Disaster Control V Public Affairs X Contingency Planning Y Distribution Z Record of Changes	

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Figure 8-27.—Standard format for an operation order.

oral orders, copy number (handwritten), issuing headquarters, the place of issue, date and time of issue, file notation, title and serial number of the order, references (maps, charts, and photomaps), and the time zone to be used throughout the order. If a code name for the operation is used, it is written on the same line as the OPOD title and number.

The **BODY** contains the task organization (when too complicated or lengthy to be contained in paragraph 3) and the five main numbered paragraphs. The five paragraphs cover the following topics in the order listed: (1) **SITUATION**, (2) **MISSION**, (3) **EXECUTION**, (4) **ADMINISTRATION AND LOGISTICS**, and (5) **COMMAND AND COMMUNICATIONS**. The acronym SMEAC (using the first letter of each topic) will help you remember these topics. Remember that the five main topics of an operation order must be covered whether the order is from a battalion commander, platoon commander, squad leader, or fire team leader. Naturally, battalion operation orders are quite lengthy, and a patrol leader's order is usually brief. A format of a patrol leader's order is shown in figure 8-28. A patrol leader's order is usually an oral one. The patrol members should take notes.

The task organization of an operation order includes the task subdivisions or tactical components that make up the command together with the names and grades of the commanders. (See fig. 8-27 again.) Support units are shown under the headquarters of the major unit that commands them—not under the headquarters of the unit they support. Attached units are shown under the headquarters of the unit to which they are attached. Units should be listed under paragraph letters that correspond to those in paragraph 3. Only the task subdivisions on the echelon of command just below the issuing unit are normally shown.

Paragraph 1. **SITUATION** always has three subparagraphs: Enemy Forces, Friendly Forces, and Attachments and Detachments. This paragraph contains information only. It does not include plans or instructions.

Paragraph 1.a. Enemy Forces contains information about the enemy that affects the operation, such as their locations, dispositions, strength, activities, and capabilities.

Paragraph 1.b. Friendly Forces contains a statement of the mission of the next higher unit; the location and planned actions of the unit on the right and left; the fire support available for the patrol; and the mission and route of other patrols.

Paragraph 1.c. Attachments and Detachments contains a list of nonorganic units attached to, and organic units detached from, the command for the specific operation. It includes the date/time the attachment or detachment will take place.

Paragraph 2. **MISSION** contains a concise statement of the mission, its purpose, and of the command as a whole. It includes "what," "how," "where," and as much of "why" as may be proper. There are no subparagraphs.

Paragraph 3. **EXECUTION** assigns definite tasks to each element of the command, organic and attached, that will contribute to carrying out the overall mission. There are no restrictions on the number of subparagraphs.

Paragraph 3.a. Concept of Operations is a clear, concise summary of how the commander visualizes the operation will be conducted. This is an enlargement of the decision contained in the commander's estimate. This paragraph should be as brief as possible; but it may be published as an annex or shown on an operation overlay if it is lengthy or detailed. If an overlay is used, it need not be written out. If an overlay or annex is used, this paragraph makes reference to it.

Paragraphs 3.b., 3.c., and so forth (tasks for subordinate units) are assigned separate lettered subparagraphs in alphabetical sequence to each major subordinate element. These subparagraphs correspond to the alphabetical listings in the task organization. Except as outlined below, all instructions to any unit having a tactical mission should appear in the subparagraph of paragraph 3 about that unit. Subparagraphs that assign tasks to other combat and combat support elements (if applicable) should follow.

The final subparagraph of paragraph 3, always entitled Coordinating Instructions, contains the details of coordination and the control measures that apply to the command as a whole; for example, objectives, comments qualifying time of attack, line of departure, boundaries, beaches, bomblines, and reference to march table annex. Many of these and other

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PATROL LEADER'S ORDER

1. SITUATION

- a. Enemy Forces: Weather, terrain, identification, location, activity, strength.
- b. Friendly Forces: Mission of next higher unit, location and planned actions of units on right and left, fire support available for patrol, mission and route of other patrols.
- c. Attachments and Detachments.

2. MISSION - What the patrol is going to accomplish.

3. EXECUTION - (Subparagraph for each subordinate unit.)

- a. Concept of operation.
- b. Specific duties of elements, teams, and individuals.
- c. Coordinating instructions.
 - (1) Time of departure and return
 - (2) Formation and order of movement
 - (3) Route and alternate route of return
 - (4) Departure and reentry of friendly area(s)
 - (5) Rallying points and actions at rallying points
 - (6) Actions on enemy contact
 - (7) Actions at danger areas
 - (8) Actions at objective
 - (9) Rehearsals and inspections
 - (10) Debriefing

4. ADMINISTRATION AND LOGISTICS

- a. Rations.
- b. Arms and ammunition.
- c. Uniform and Equipment (state which members will carry and use).
- d. Method of handling wounded and prisoners.

5. COMMAND AND SIGNAL

- a. Signal.
 - (1) Signals to be used within the patrol.
 - (2) Communication with higher headquarters - radio call signs, primary and alternate frequencies, times to report and special code to be used.
 - (3) Challenge and password.
- b. Command.
 - (1) Chain of command.
 - (2) Location of patrol leader and assistant patrol leader in formation.

Figure 8-28.—Format for patrol leader's order.

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instructions that apply to two or more elements of the command may be indicated in an attached overlay. In this case, they need not be repeated here. In this paragraph essential elements of information might be included (unless an intelligence annex is issued). Examples are operational reports to be submitted, if not set forth elsewhere by written order, preparatory fire information, and the effective time of the order.

Paragraph 4. **ADMINISTRATION AND LOGISTICS** contains administrative and logistic instructions, if an administrative order is not issued. If an order is issued, this paragraph refers to that order. In a small command, such as a naval mobile construction battalion, this paragraph contains all the necessary information and instructions about supply, evacuation, hospitalization, transportation, service, personnel, and similar matters.

Paragraph 5. **COMMAND AND SIGNAL** contain instructions about command, command relationships, and the operations of communications and electronics.

Paragraph 5.a. Signal may refer to a standard plan or to a communications annex if one has been issued. If a communications annex has not been issued, paragraph 5a should contain references to the index of communications instructions (COI) currently in effect, instructions on the use of radio and pyrotechnics, and restrictions on the use of any means of communication.

Paragraph 5.b. Command gives the location of the command post of the issuing unit and those of subordinate units, when they are known. When the location of the command post of subordinate units is unknown, instructions about the reporting of command posts when opened may be included.

Paragraph 5.c. This subparagraph shows the axis of communications (indicated by successive tentative command post locations) and the location and time of opening of the message centers.

Also, subparagraphs may be included about recognition and identification instructions, electronic policy, code words, liaison, and command relationships. Most items in paragraph 5 can usually be shown graphically on the operation map or overlay. If this is done, they need not be repeated in writing.

The **ENDING** of an operation order contains the signature, a list of annexes (if any), the distribution, the authentication (except on the original), and the classification.

Annexes to Operation Orders

Annexes to OPORDs include those used for purposes of brevity, clarity, and simplicity (for example, maps and overlays). Annexes may also be used to amplify an order when the volume is too great to be included in the order itself.

Annexes are issued to all units whose actions or movements are affected by the information and instructions they contain.

Written annexes usually follow the form required for the complete OPORD except that information and instructions already given in the order need not be repeated in the annex. Annexes are lettered alphabetically in the order used in the OPORD.

Maps of the following types are frequently used as annexes: situation maps, operation maps, administrative maps, and circulation maps.

Annexes dealing with embarkation, debarcation, entraining, entrucking, march tables, and other technical data are shown in tabular form.

Prepare and submit the annexes to the commander for approval and signature prior to issue. Another staff officer verifies the annexes.

Preparing OPORDs

Orders must be clear, concise, and direct. Those giving missions for subordinate units should prescribe only the details or methods of execution needed to ensure that the actions of that specific subordinate unit will conform to the plan of operations for the force as a whole.

Paragraphs 1 and 2 of an OPORD are usually written in the present tense. For simplicity and clarity, the affirmative form of expression is used throughout the order.

When the date and hour are undetermined, D-day and H-hour may be substituted; when the final date and hour are selected, they are communicated later to those concerned.

When the hour is given, it will be expressed in the 24-hour-clock system with no punctuation between the hours and minutes. Whenever orders apply to units in different time zones, Greenwich

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mean time or the time zone specified by higher headquarters will be used. The zone suffix letter will immediately follow the last digit of the group. For example, time expressed as 060225 March 84, indicates 6 March 1984 at 2:25 a.m. Greenwich mean time.

An OPORD that specifies a night should include both dates, for example, "night 4—5 Aug 84."

Boundaries are assigned that limit zones of action or movement and areas of responsibility. These are designated by easily distinguishable terrain features in the sequence in which they occur on the ground. This sequence is normally given in the direction of the enemy, but in the case of retrograde movement, in the reverse direction.

Geographical names are written or printed in capital letters. This minimizes the chance of error and makes the places mentioned stand out prominently in the order. The spelling in the order must be the same as that on the map referred to in the heading of the order.

Compass points are preferable to the terms "right" and "left." Should right or left be necessary, the user is assumed to be facing the enemy or downstream if used with reference to a river.

When places or features are difficult to find on the map or when confusion may arise with names of similar spelling, they should be identified by coordinates or by stating locations in relation to some easily recognized feature or place on the map.

Roads are identified by name or by a sequence of points on the road; they are named in the direction of movement. When there is no movement from right to left or rear to front, it is assumed that the person naming the road is facing the enemy. All other lines are designated in the same manner.

Areas are indicated by names, counter-clockwise with a suitable number of limiting points. The first point named, regardless of whether the area pertains to friendly troops or to the enemy, is one on the right front facing friendly troops.

Expressions like "attack vigorously" are avoided. They are not only meaningless and wordy, but also weaken the force of later orders in which the expression does not appear. "Holding attack," "secondary attack," and

"main attacks," which qualify the vigor of the operation, and "try and hold" and "far as possible," which lessen responsibility, are further examples of undesirable phrases for use in OPORDs.

In operation orders, it is essential that there is no opportunity for misunderstanding by any subordinate of the exact intended meaning of each term used. If you are leading partially trained troops and staffs, remember that the use of technical military language may cause these misunderstandings. Therefore the use of technical expressions in combat orders should be avoided if there is any danger of misunderstanding by personnel in the unit. You should substitute words that are easy to understand even at the expense of brevity. Clarity is the first essential; technique is secondary.

COUNTERSIGNS

The commanding officer directs the use of the countersign. Sentries of an interior guard may use the countersign, but countersigns are primarily for use by sentries or persons defending tactical areas.

By Whom Authorized

If a countersign is prescribed, the highest headquarters within a zone or area devises it. The authority to designate a countersign may be delegated to subordinate units for their immediate use when necessary. However, these units must notify higher headquarters of such action without delay. Only one countersign can be used within a command during a specified period.

Selecting the Countersign

The choice of words or sounds for the countersign is made with care. If possible, words are selected that are difficult for the enemy to pronounce. To minimize the possibility of an unauthorized person guessing the password, the word selected for the secret challenge, or countersign must not suggest the word selected for the password. (For example, the secret challenge, **ATOMIC**, suggests the password **BOMB**.)

Using the Countersign

The initiative for use of the countersign rests with the challenging sentry. Positive recognition of all persons claiming authority to pass is the sentry's main consideration. If he does not visually recognize the challenged person or party, he uses the countersign to make a positive recognition. If there is any doubt of the challenged person's authority to pass even if he gives the correct password, he is detained for further action by the corporal of the guard. If the sentry recognizes the challenged person or party prior to using the countersign and there is no doubt that the person or party has authority to pass, the sentry will not use the countersign.

Mutual identification is essential. If the person challenged does not recognize the secret countersign, he should not give the password.

When a secret challenge and password are prescribed, the secret challenge is given by the sentry after the person is advanced to be recognized. The person challenged should then give the password. Both the secret challenge and the password are given in a low tone to prevent them from being heard by others.

For example, a sentry observes a person approaching his post during the time for challenging. When the person is still far enough away from the sentry's post for the sentry to take effective measures should the person rush him after being challenged, he commands, "**HALT! WHO IS THERE?**" After receiving an answer (such as, "Lieutenant Jones, Company B") indicating the person is friendly and may be authorized to pass, the sentry says, "Advance, Lieutenant Jones to be recognized." When Lieutenant Jones reaches a point where the secret challenge, spoken in a low tone, can be heard only by him, the sentry again commands, "**HALT!**" then he gives the secret challenge or countersign, in a low tone (for example, "**SNOWFLAKE**"). After receiving the correct password from Lieutenant Jones (for example, "**ROOSTER**") and otherwise satisfying himself that the Lieutenant is authorized to pass, the sentry says, "Advance, Lieutenant Jones" and salutes, if appropriate. If Lieutenant Jones is one of a party challenged and is the person advanced according to the procedures discussed here, the sentry then tells Lieutenant Jones to bring up his men and identify each individual before he passes.

CHAPTER 9

SHELTERS, BUNKERS, AND ENTANGLEMENTS

This chapter will provide you with information about the construction and use of shelters, bunkers, and wire entanglements.

HASTY SHELTERS

Hasty shelters are constructed primarily to protect military personnel, equipment, and supplies from enemy action and the weather. Hasty shelters differ from emplacements because there are usually no provisions for firing weapons from them. However, they are usually constructed near or supplement the fighting positions. When natural shelters, such as caves, mines, woods, or tunnels are available, they are used instead of constructing artificial shelters. Caves and tunnels must be carefully inspected by competent persons to determine their suitability and safety. The best shelter is usually the one that will provide the most protection with the least amount of effort. Actually, combat troops that have prepared defensive positions have some shelter in their fighting-holes or weapon emplacements. Hasty shelters are frequently prepared by troops in support of frontline units. Troops making a temporary halt in inclement weather when moving into positions prepare hasty shelters as do units in bivouacs, assembly areas, rest areas, and static positions.

The best observation is from a surface shelter. It is easier to enter or leave than an underground shelter. It also requires the least amount of labor to construct, but it is hard to conceal and requires a large amount of cover and revetting material. Of the types of shelters discussed in this chapter, surface shelters provide the least amount of protection from nuclear weapons. Surface shelters are seldom used for personnel in forward combat positions unless they can be concealed in woods, on reverse slopes, or among buildings. It may be necessary to use surface shelters when the water

level is close to the surface of the ground or when the surface is so hard that digging an underground shelter is impractical.

Underground shelters generally provide good protection against radiation because the surrounding earth and overhead cover are effective shields against nuclear radiation.

Cut-and-cover shelters are dug into the ground and backfilled on top with a layer, as thick as possible, of rocks, logs, sod, and excavated soil. These and cave shelters provide excellent protection from weather and enemy action.

Wherever possible, shelters should be sited on reverse slopes, in woods, or in some form of natural defilade, such as ravines, valleys, and other hollows or depressions in the terrain. They should not be in the path of natural drainage lines. All shelters must be camouflaged or concealed.

CONSTRUCTION

Hasty shelters are constructed with a minimum expenditure of time and labor using available materials. They are ordinarily built above ground or dug in deep snow. Shelters that are completely above ground offer protection against the weather and supplement or replace shelter tents which do not provide room for movement. Hasty shelters are useful in the winter when the ground is frozen, in mountainous country where the ground is too hard for deep digging, in deep snow, and in swampy or marshy ground.

Sites for Winter Shelters

Shelter sites near wooded areas are the most desirable in winter because these areas are warmer than open fields. They conceal the glow of fires and provide fuel for cooking and heating. In heavy snow, tree branches extending to the ground offer some shelter to small units.

Materials

Work on winter shelters should start immediately after the halt so that the men will keep warm. The relaxation and warmth offered by the shelters are usually worth the effort expended in constructing them. Beds of foliage, moss, straw, boards, skis, parkas, or shelter halves may be used as protection against dampness and cold from the ground. Snow should be removed from clothing and equipment before entering the shelter. The entrance of the shelter is located on the side that is least exposed to the wind, is close to the ground, and has an upward incline. Plastering the walls with earth and snow reduces the effects of wind. The shelter itself should be as low as possible. The fire is placed low in fire holes and cooking pits.

Snow is windproof, but you need to keep the occupant's body heat from melting the snow. Therefore, place a layer of some insulating material, such as a shelter half, blanket, or other material, between the body and the snow.

TYPES OF HASTY SHELTERS

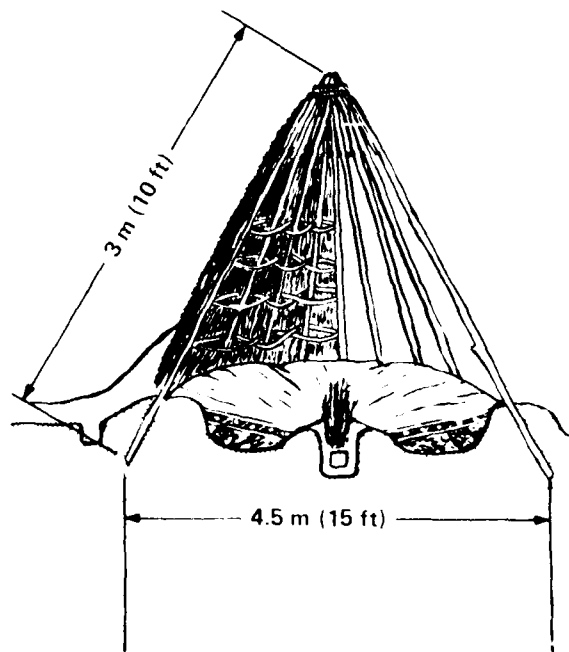
The following types of hasty shelters are used by American military forces.

Wigwam Shelter

This type of shelter (fig. 9-1, view A) may be constructed easily and quickly when the ground is too hard to dig and shelter is required for a short bivouac. It will accommodate three men and provide space for cooking. Cut about 25 evergreen saplings, 2 to 3 inches in diameter and 9 feet long. Leave the limbs on the saplings, and lean them against a small tree so the butt ends are about 7 feet up the trunk. Tie the butts together around the tree with a tent rope, wire, or other means. Space the ground end of the saplings about 1 foot apart around the tree and about 7 feet from the base of the tree. Then, trim the branches off inside the wigwam and bend down on the outside so that they are flat against the saplings. Use the branches trimmed off from the inside to fill in the spaces that are left. Shelter halves wrapped around the outside make it more windproof, especially after



A. BUILT AROUND A TREE



B. BUILT ENDS LASHED

Figure 9-1.—Wigwam.

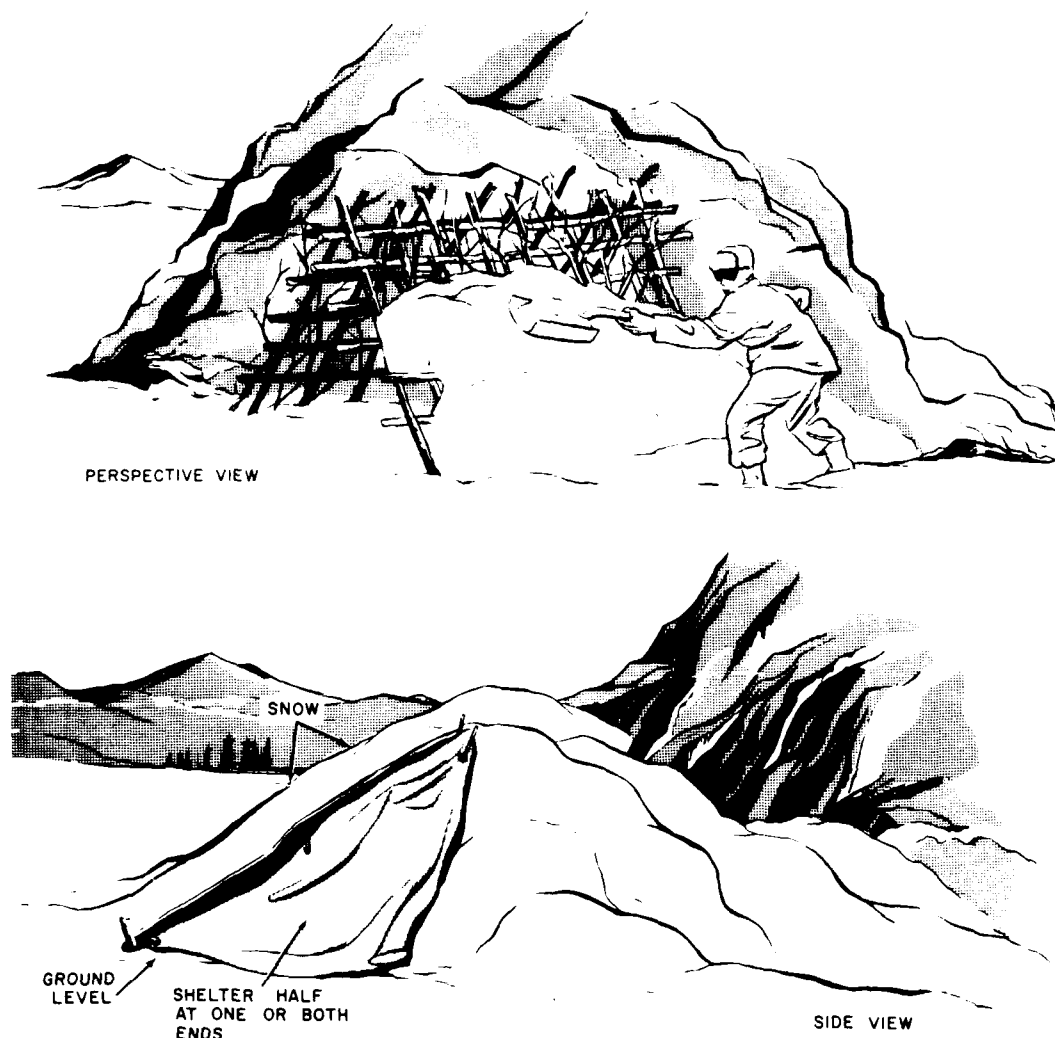


Figure 9-2.—Lean-to shelter.

it is covered with snow. A wigwam can also be constructed as shown in figure 9-1, view B, by lashing the butt ends of the saplings together instead of leaning them against the tree.

Lean-to Shelter

This shelter (fig. 9-2) is made of the same material as the wigwam (natural saplings woven together and brush). Place the saplings against a rock wall, a steep hillside, a deadfall, or some other existing vertical surface, on the leeward side. Close the ends with shelter halves or evergreen branches.

Two-Man Mountain Shelter

This shelter (fig. 9-3) is useful, particularly in winter or in inclement weather when there is

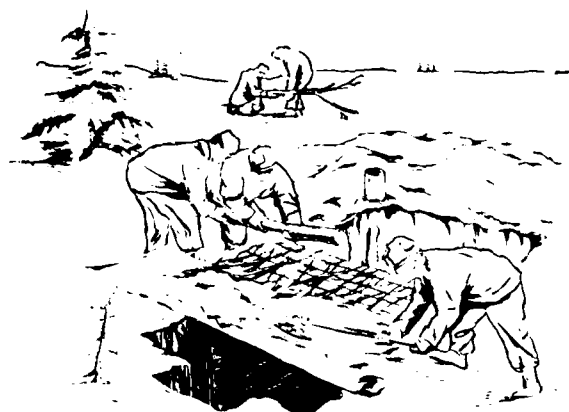


Figure 9-3.—Two-man mountain shelter.

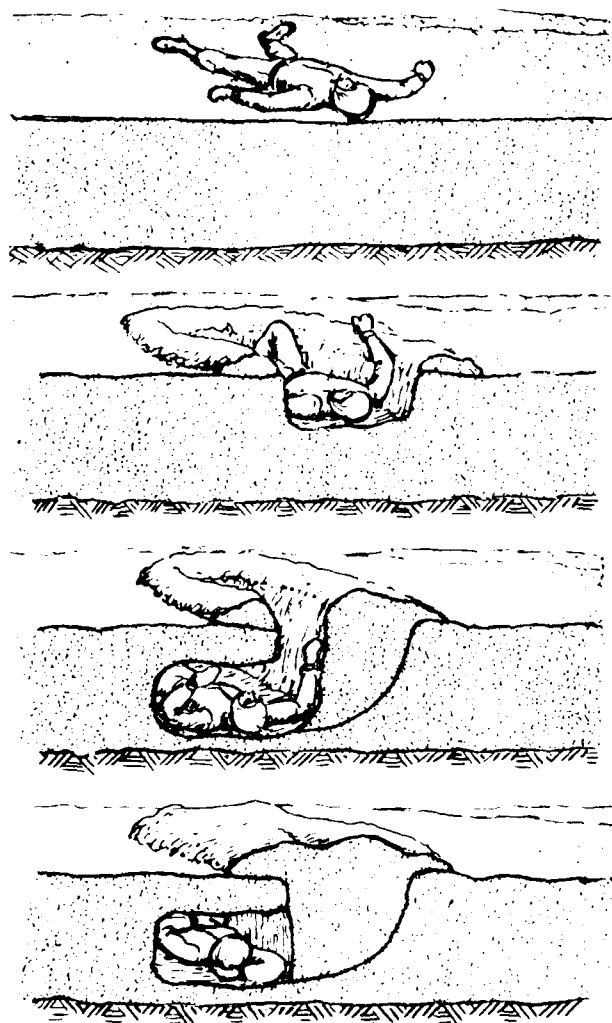


Figure 9-4.—Making a snow hole without tools.

frequent rain or snow. It is basically a hole 7 feet long, 40 inches wide, and 40 inches deep. Cover the hole with 6- to 8-inch diameter logs; then add evergreen branches, a shelter half, and local material such as topsoil, leaves, snow, and twigs. Cover the floor with evergreen twigs, a shelter half, or other expedient material. Provide entrances at both ends if desired. A fire pit may be dug at one end for a small fire or stove. Build a low earth parapet around the shelter to provide more height for the occupants.

Snow Hole

The snow hole (fig. 9-4) is a simple, one-man emergency shelter for protection against a snow

storm in open, snow-covered terrain. It can be made quickly, even without tools. Lying down in snow at least 3.3 feet deep, push with your feet, dig with your hands, and repeatedly turn over, forming a hole the length of your body and as wide as your shoulders. At a depth of at least 3.3 feet, dig in sideways below the surface, filling the original ditch with the snow that has been dug out until only a small opening remains. This opening may be entirely closed, depending on the enemy situation and the temperature; the smaller the hole, the warmer the shelter.

Snow Cave

Make snow caves (fig. 9-5) by burrowing into a snowdrift and fashioning a room of desirable size. This type of shelter gives good protection from freezing weather and a maximum amount of concealment. Slope the entrance upward for the best protection against the penetration of cold air. You can build snow caves large enough for several men if the consistency of the snow is such that it will not cave in. Use two entrances while the snow is being taken out of the cave; refill one entrance with snow when the cave is completed.

Snowpit

Dig the snowpit (fig. 9-6) vertically into the snow with entrenching tools. It is large enough for two or three men. Use skis, poles, sticks, branches, shelter halves, and snow as roofing. The inside depth of the pit depends upon the depth of the snow, but should be deep enough for

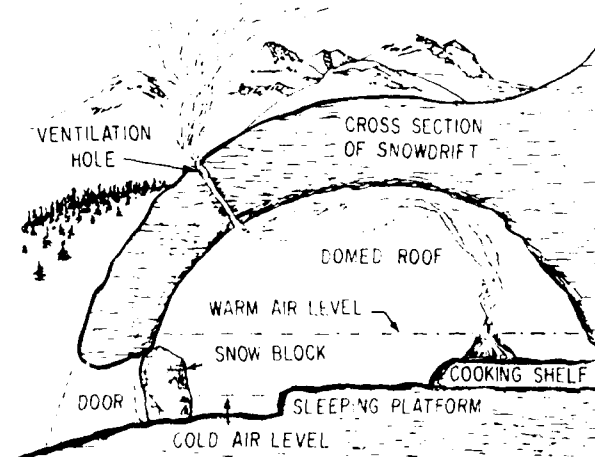


Figure 9-5.—Snow cave.

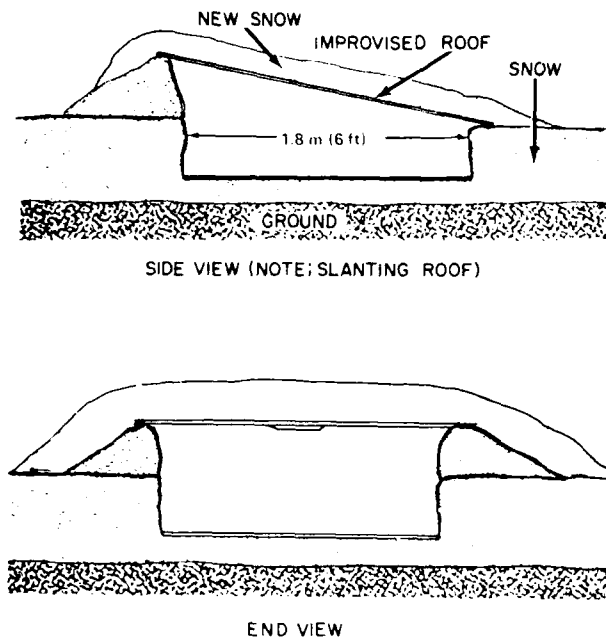


Figure 9-6.—Snowpit in shallow snow.

kneeling, sitting, and reclining positions. The roof should slope toward one end of the pit. If the snow is not deep enough, the sides of the pit can be made higher by adding snow walls.

Snowhouse

The size and roof of a snowhouse are similar to those of a snowpit. The walls consist of snowblocks and may be built to the height of a man. Snow piled on the outside seals the cracks and camouflages the house (fig. 9-7).

Tropical Shelter

A satisfactory bed and rain shelter (fig. 9-8) may be constructed in a short time from natural materials. The bed itself is made first about 40 inches above the ground. Drive four forked stakes, about 5 feet long and 2 inches in diameter, into the ground. Then, lash a timber framework together with vines, rope, or place wire on the stakes. Lay stout and pliable reeds, such as bamboo shoots, over the framework and cover with several layers of large, fine ferns. Drive four longer stakes into the ground alongside the bed stakes for the roof. There must be some pitch to the roof to permit the rain to run off. Lay leaves for the roofing with the butt ends toward the high end of the shelter.

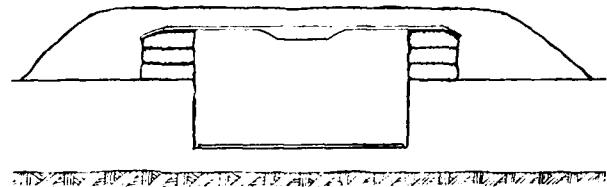


Figure 9-7.—Snowhouse with snowblock walls.

DELIBERATE SHELTERS AND BUNKERS

Deliberate shelters are the most effective type of shelter; they can be underground, cut-and-cover, or cave shelters. Deliberate shelters should be provided with as deep an overhead cover as possible. They should be dispersed and have a maximum capacity of 20 to 25 men. Supply shelters may be of any size, depending on location, time, and materials available. The larger the shelter, the greater the necessity for easy entrance and exit. Large shelters should have at least two well-camouflaged entrances spaced widely apart. The farther away from the front lines, the larger, deeper, and more substantial a shelter may be constructed. Because you need more freedom of movement and easier access to materials and equipment, more time is spent constructing it.

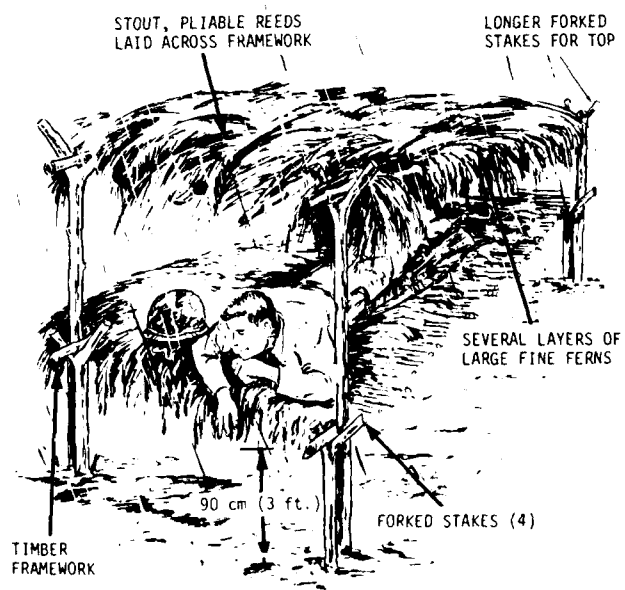


Figure 9-8.—Jungle rain shelter.

CONSTRUCTION REQUIREMENTS

DRAINAGE is an important consideration particularly in cut-and-cover and cave shelters. After the shelter is dug, drainage work usually includes keeping the surface and rain water away from the entrance, preventing water from seeping into the interior by ditching, and removing water that has collected inside the shelter. The floors of shelters must have a slope of at least 1 percent toward a sump (fig. 9-9) near the entrance, while the entrance should be sloped more steeply toward a ditch or sump outside the shelter (fig. 9-10).

VENTILATION is particularly important in cave shelters, especially if you need to close the entrances during an attack. In surface and cut-and-cover shelters, you can usually obtain enough fresh air by keeping entrances open. Vertical shafts bored from within cave shelters are desirable if not absolutely essential. A stovepipe through a shaft assists the circulation of air. Shelters with poor ventilation should be used only by inactive personnel. Since an inactive man requires about 1 cubic foot of air per minute, unventilated shelters are limited in capacity. Initial airspace requirements for shelters for not over 12 men are 350 cubic feet per man.

An **ENTRANCE COVERING** is an important construction feature of deliberate shelters. If gas-proof curtains are not available, use improvised curtains made of blankets hung on light, sloping frames. They should be nailed securely to the sides and top entrance timbers. Place curtains for cave shelters in horizontal entrances or horizontal

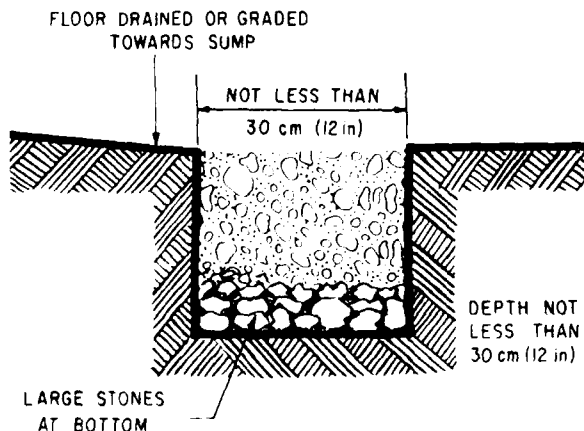


Figure 9-9.—Sump for shelter drainage.

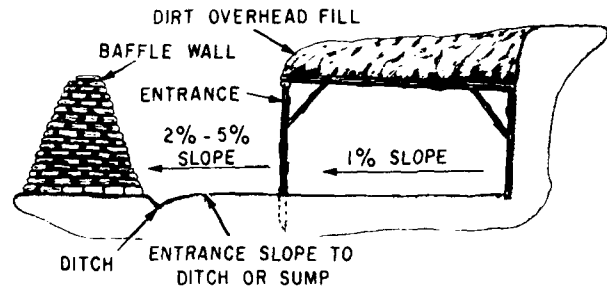


Figure 9-10.—Floor and entrance drainage.

approaches to inclines. Cover windows with single curtains. Caulk all crevices with clay, old cloths, or sandbags. Keep flooring or steps in front of gas curtains clear of mud and refuse. Small, baffled entrances and right angle turns, or both, will reduce the effects of nuclear blasts and will keep debris from being blown in. Construct baffle walls of sod or sandbags. Avoid materials that can be injurious to the occupants.

Provide **SANITARY CONVENIENCES** in all but air-raid emergency shelters and surface shelters, where heads are available. Dispose of waste by burial or chemical treatment. When waterborne sewage facilities are available, disposal can be into septic tanks or sanitary sewers.

LIGHT SECURITY is another important construction feature. Install blackout curtains in the entrance to all shelters to prevent light leakage. To be most effective, hang blackout curtains in pairs so that one shields the other. Use blankets, shelter halves, or similar material for this purpose.

EMERGENCY EXITS in larger shelters are desirable in case the main exit is blocked. If possible, the emergency exit should be more blast-resistant than the main entrance. This can be done by making it just large enough to crawl through. Corrugated pipe sections or 55-gallon drums with the ends removed are useful in making this type of exit. Construct a simple blast-resistant emergency exit by sloping a section of corrugated pipe from the shelter up to the surface, bracing a cover against the inside, and filling the section of pipe with gravel. When the inside cover is removed, the gravel will fall into the shelter, and the occupants can crawl through the exit without digging.

MARKING THE INTERIOR OF THE SHELTER is an optional construction feature. Mark the maximum capacity of shelters on the entrances or interior walls with reflective tape or

paint to help troops entering in the dark. There should be no sacrifice of camouflage discipline.

LOG SURFACE SHELTER

Construct a log shelter (fig. 9-11) in the form of a box braced in every direction. The framework must be strong enough to support a minimum of 18 inches of earth cover. In addition, it must withstand the concussion of a near-miss of a shell or bomb or the shock of a distant nuclear explosion. The size of the logs used is limited by the size of available logs for the roof supports and by the difficulty of transporting large timbers.

1. Size. Shelters 6.5 to 10 feet wide by 14 feet long are suitable for normal use.

2. Timbers. All timbers should be the same size, if possible, approximately 6 to 8 inches in diameter depending on the width of the shelter (table 9-1). Space the uprights approximately 2 feet apart except at the entrance where they may have to be spaced farther apart. Space the roof supports the same as the uprights. Drill holes for driftpins at all joints.

3. Bracing. Nail 1-inch by 4-inch boards for the diagonal bracing to caps, sill, and uprights.

4. Walls. Cover the log shelter frame with board or saplings and backfill it with approximately 2 feet of earth, or construct a hollow wall around the buildings, and then fill it with dirt.

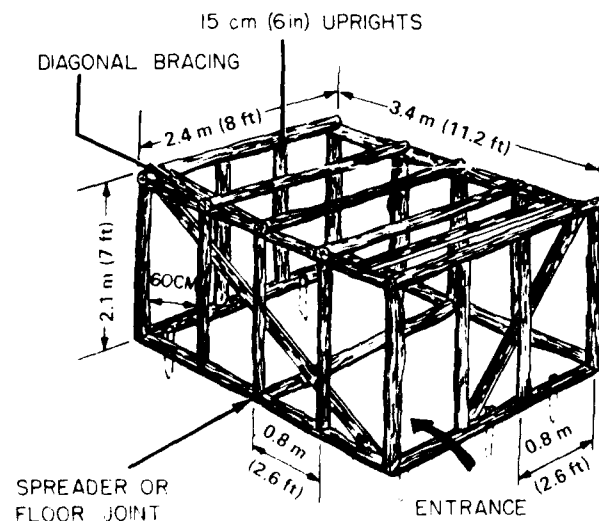


Figure 9-11.—Log framed shelter.

Table 9-1.—Size of Roof Supports

Size of timber (diameter)	Maximum span when used to support 45 cm of earth
10 cm (4 in.)	1.2 meters (4 feet)
12.5 cm (5 in.)	1.5 meters (5 feet)
15 cm (6 in.)	2.1 meters (7 feet)
17.5 cm (7 in.)	2.7 meters (9 feet)
20.0 cm (8 in.)	3.3 meters (11 feet)
22.5 cm (9 in.)	3.9 meters (13 feet)

5. Cover. Lay a roof of planks, sheet metal, or other material over the roof supports and perpendicular to them to hold a minimum of 18 inches of earth cover. This amount of cover is effective against fragmentation (shrapnel) effects of mortars, artillery, and rockets.

SECTIONAL SHELTERS (SURFACE OR SUBSURFACE)

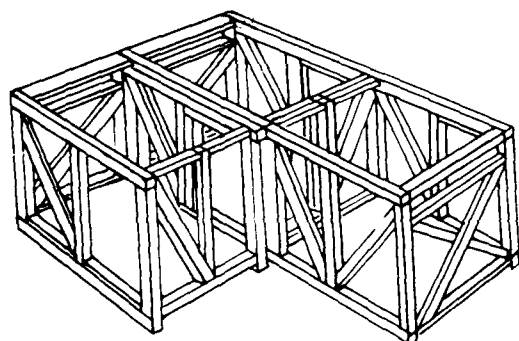
Sectional shelters (fig. 9-12) are designed as 6-by-8-foot units that can be used individually or in combinations of two or more sections. They can be used as surface or subsurface shelters. Sectional shelters can be used as command posts or aid stations. The advantages of sectional shelters include

1. the flexibility of the shelter area that can be provided,
2. the depth of cover the shelter will support,
3. the design lends itself to prefabrication, and
4. the ease in transporting by helicopter (except for the cover).

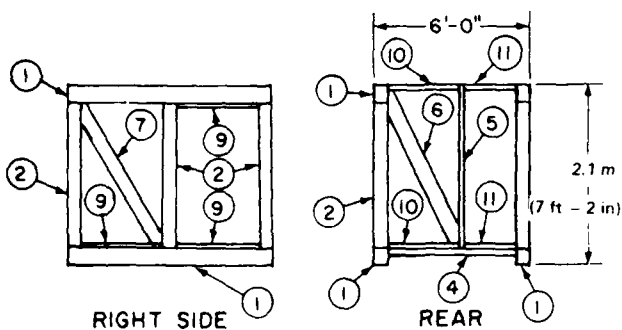
Site a shelter on a reverse slope for cut-and-cover construction.

Assuming that each bent or side unit (fig. 9-12 and table 9-2) is sheathed before installation, excavate a 7- by 10-foot area for one section. The additional length of the excavated area will provide working space to install sheathing on the rear unit. Excavate the shelter area to a depth of 12 feet. This depth allows for a heavy overhead cover laminated roof (18 inches) and 10 feet 6 inches for a heavy overhead cover stringer roof.

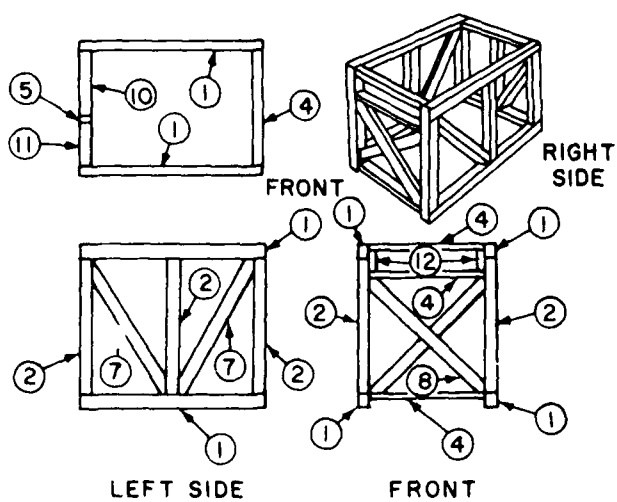
You can assemble and sheath the two bents, or side units, before placing them in the excavated area. Install driftpins in the sills, caps, and posts before placing the units in the excavated area. Toenail the bracing on the side units as well as the bracing and spreaders on the front and rear units.



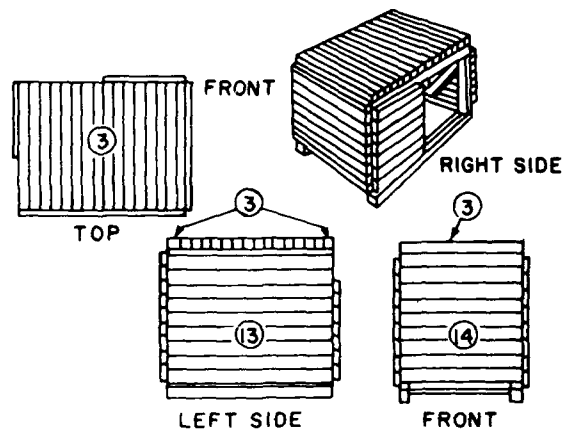
1. TYPICAL CONNECTION OF THREE SECTIONS



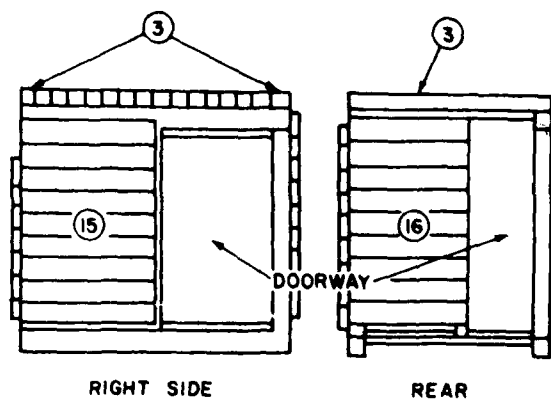
2. FRAMING DETAILS



3. FRAMING DETAILS



4. SHEATHING DETAILS



5. SHEATHING DETAILS

Figure 9-12.—Sectional shelters.

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Chapter 9—SHELTERS, BUNKERS, AND ENTANGLEMENTS

Table 9-2.—Bill of Material for One 6-Foot by 8-Foot Sectional Shelter With Post, Cap, and Stringer Construction—Dimensional Timber

Material list				Quantities			
No.	Nomenclature	Rough size	Roof	Front	Right	Left	Rear
1	Cap or sill	6"x8"x8'0" (15cm x 20.5cm x 246cm)			2	2	
2	Post	6"x6"x5'10" (15cm x 15cm x 180cm)			3	3	
3	Stringer**	6"x6"x6'0" (15cm x 15cm x 184cm)	16				
4	Spreader	3"x6"x5'0" (7.5cm x 15cm x 150cm)		2			1
5	Post, door	3"x6"x6'6" (7.5cm x 15cm x 195cm)					1
6	Brace	*3"x6"x7'0" (7.5cm x 15cm x 215cm)					1
7	Brace	*3"x6"x6'10" (7.5cm x 15cm x 210cm)			1	2	
8	Brace	*3"x6"x8'0" (7.5cm x 15cm x 246cm)		2			
9	Spreader	2"x6"x3'3" (5cm x 15cm x 97.5cm)			3		
10	Spreader	2"x6"x2'9" (5cm x 15cm x 82.5cm)					2
11	Spreader	2"x6"x2'0" (5cm x 15cm x 60cm)					2
12	Scab	3"x6"x2'0" (7.5cm x 15cm x 60cm)					
13	Siding	3"xRWx8'0" (7.5cm x RW x 246cm)				41 1 3SF	
14	Siding	3"xRWx6'0" (7.5cm x RW x 184cm)		36SF			
15	Siding	3"xRWx4'0" (7.5cm x RW x 120cm)			24SF		
16	Siding	3"xRWx3'6" (7.5cm x RW x 107cm)					21SF
17	Roll roofing	100 sq ft roll (9.3 sq meters)	6				
18	Driftpin	1 2"x14" (1.25cm x 35cm)	32		6	6	
19	Nails	60d		8 lb	8 lb	8 lb	8 lb

*Allowance for double out ends of braces is included in overall length as shown under rough size.

**Laminated wood roof may be substituted if desire.

Size of rectangular timber	Size of round timber required to equal (in inches)
6x6	7
6x8	8
8x8	10
8x10	11
10x10	12
10x12	13
12x12	14

Construction Notes

- Any combination of the four types of side panels shown may be used in regard to location and number of doors required.
- In the construction of two or more basic units, the exterior wall panels should be based on the number and position of doorways required. Panels to be coupled in the interior of the shelter, forming a double wall, must be of the same type wall construction and provide doorways. Siding is not required on interior walls.

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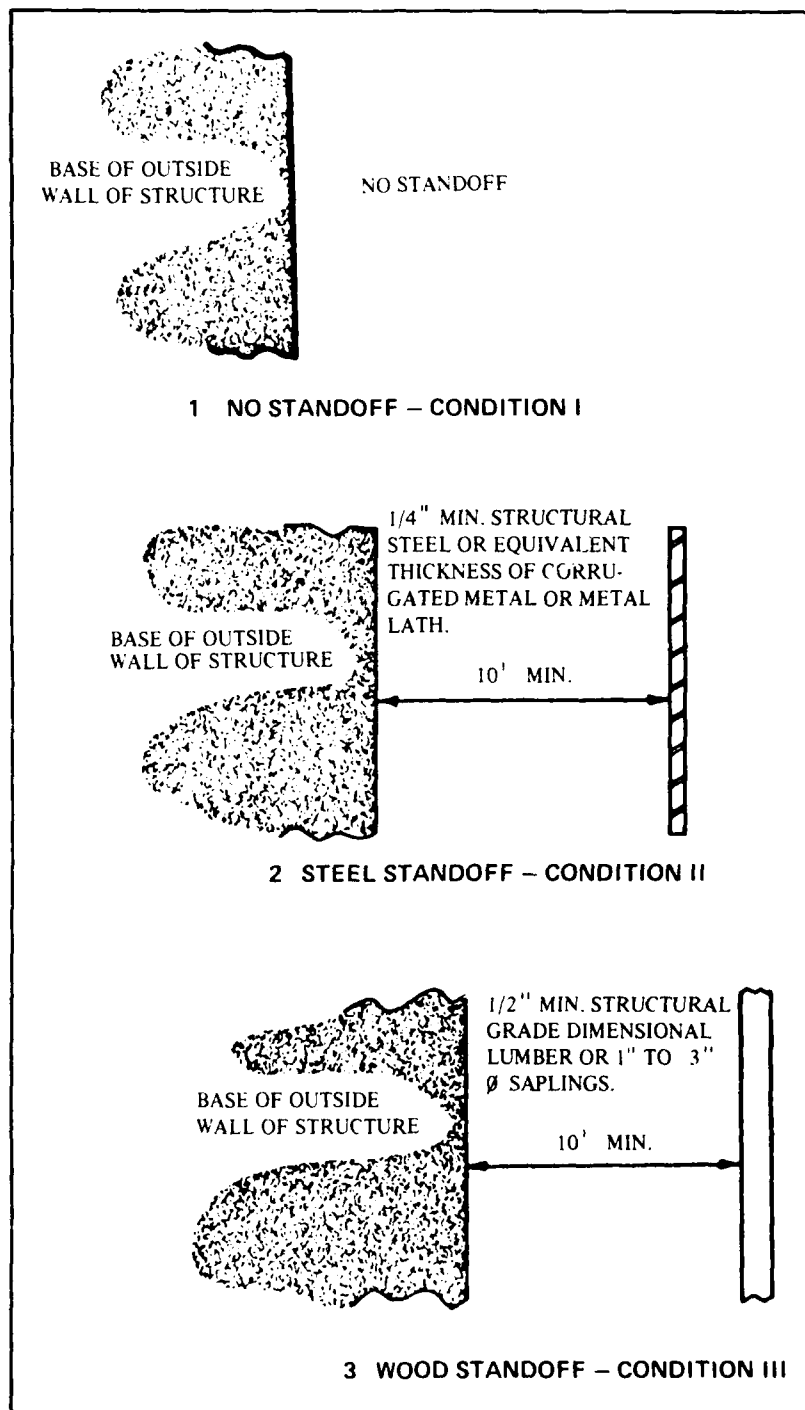


Figure 9-13.—Standoff condition.

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Chapter 9—SHELTERS, BUNKERS, AND ENTANGLEMENTS

Table 9-3.—Minimum Thickness of Protective Material Required to Resist Penetration of Rounds

Condition I—No Standoff
Material in Inches

Types of ammunition	Soil ¹	Sand ¹	Clay ¹	Soil cement bituminous concrete	Concrete	Timber	Aluminum	Steel
.30 cal. ball (AP)	24	24	30	18	9	60	2 6	1 3
.50 cal. ball (AP)	36	30	54	18	9	120	4 4	2 2
57-mm recoilless rifle	12	12	24	20	10	20	9 0	5 0
82-mm recoilless rifle	27	27	54	42	22	48	21 0	12 5
90-mm recoilless rifle	40	42	80	66	33	76	32 0	19 5
107-mm recoilless rifle	48	48	96	84	42	88	40 0	22 5
60-mm mortar	48	30	64	20	10	20	2 8	1 0
81-mm mortar	60	42	90	26	18	27	3 7	1 3
120-mm mortar	70	48	120	32	16	36	4 7	1 7

Condition I—No Standoff
Material in Metric Measurement
(cm)

Types of ammunition	Soil ¹	Sand ¹	Clay ¹	Soil cement bituminous concrete	Concrete	Timber	Aluminum	Steel
.30 cal. ball (AP)	60	60	75	45	22.5	150	6.5	3.2
.50 cal. ball (AP)	90	75	135	45	22.5	300	11	5.5
57-mm recoilless rifle	30	30	60	50	25	50	22.5	12.5
82-mm recoilless rifle	67.5	67.5	135	105	55	120	52.5	31.2
90-mm recoilless rifle	100	105	200	165	82.5	190	80	48.7
107-mm recoilless rifle	120	120	240	212	105	200	100	56.2
60-mm mortar	120	75	160	50	25	50	7	2.5
81-mm mortar	150	105	225	65	45	67.5	9.2	3.2
120-mm mortar	175	120	300	80	40	90	11.7	4.2

Conditions II and III—.6cm ($\frac{1}{4}$ -inch) Steel or 1.3 cm ($\frac{1}{2}$ -inch) Timber Standoff³

With a .6cm ($\frac{1}{4}$ -inch) steel or 1.3cm ($\frac{1}{2}$ -inch) timber standoff, reduce by 50% the value shown under Condition I.

¹ Refers to depth a delay fuzed round will penetrate into the various materials. The amount of material required to defeat fragments from the fragmentation ammunition given would be considerably less than shown.

² Add 50% if wet.

³ Timber standoffs are ineffective against .30 and .50 cal. ball (AP) ammunition. Increase the thickness of the material to the values found in the table for condition I opposite .30 and .50 cal. ball (AP) ammunition.

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USE OF STANDOFFS

A standoff is a steel or wood curtain or chain link fence erected approximately 10 feet in front of the protective structure. It detonates shells and thereby reduces their subsequent penetrating effect. A standoff is optional, but desirable, as

additional protection to those protective structures most likely to sustain enemy fire.

A construction "condition" (fig. 9-13 and table 9-3) refers to a protective structure with or without a standoff.

- Condition I—the structure has no standoff

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● Condition II—the structure has a steel standoff

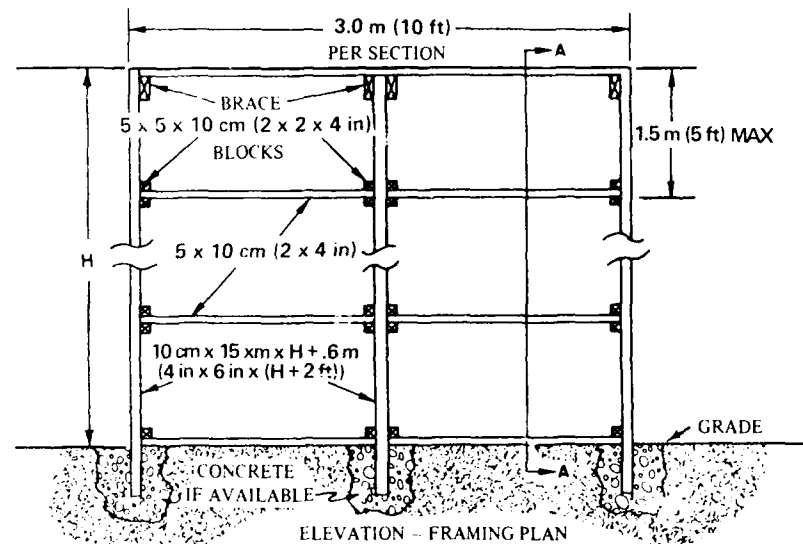
● Condition III—the structure has a wood standoff (figs. 9-14 and 9-15).

A chain link fence standoff is shown in figure 9-16. Table 9-3 shows comparison of relative thicknesses of protective materials

needed to withstand penetration of various types of ammunition—with and without standoffs.

SUBSURFACE SHELTERS

Cut-and-Cover Shelters. The log shelter shown in figure 9-11 is suited to cut-and-cover construction or surface construction. The best



CONDITION III

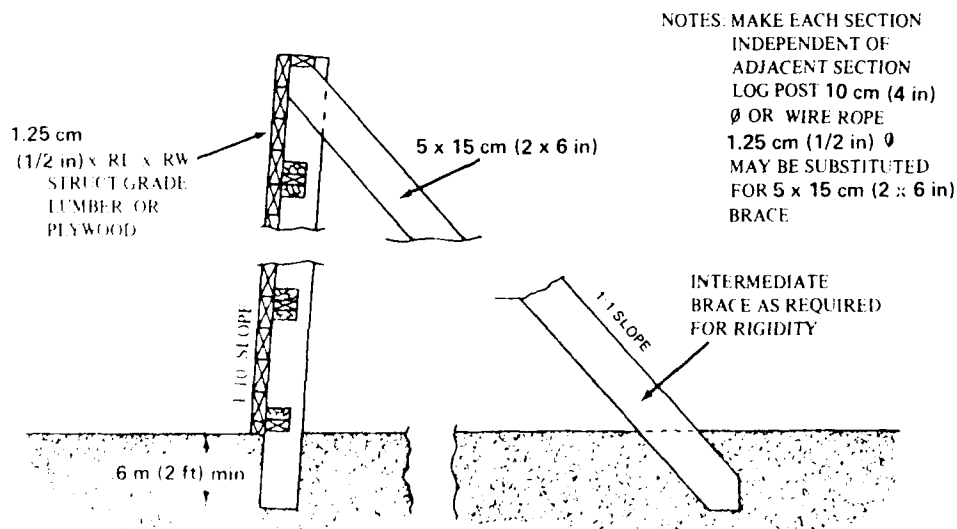


Figure 9-14.—Wooden standoff.

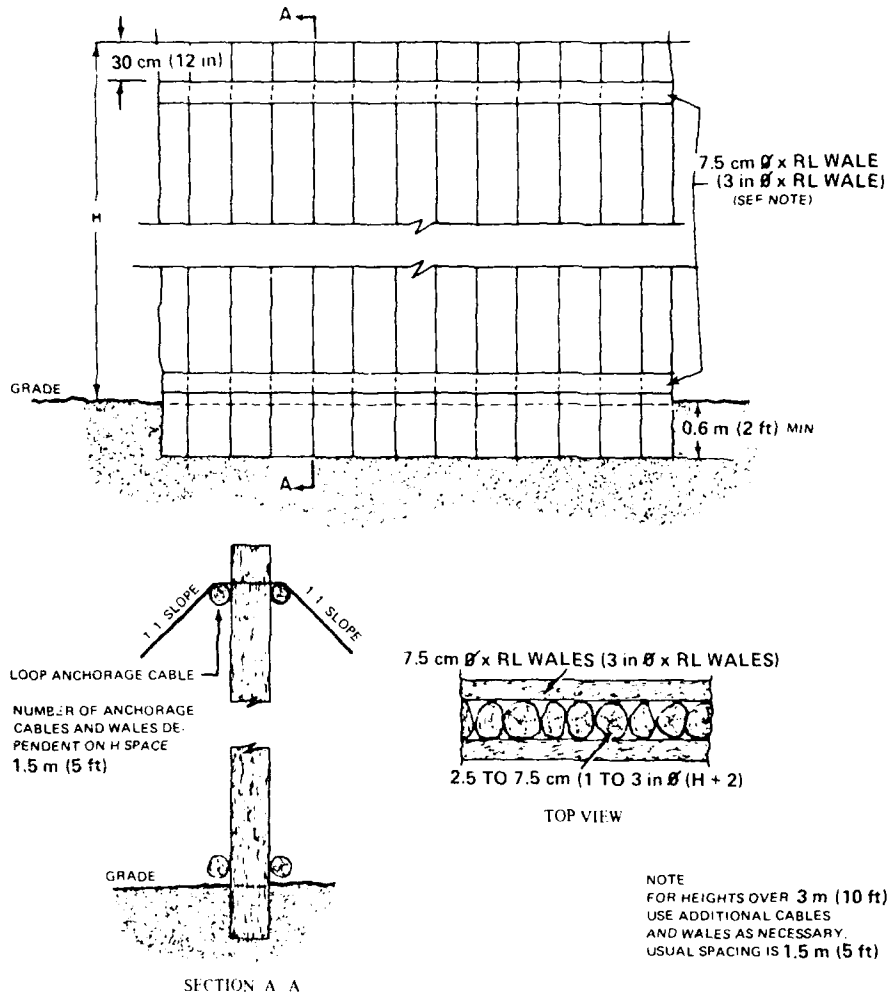


Figure 9-15.—Log standoff.

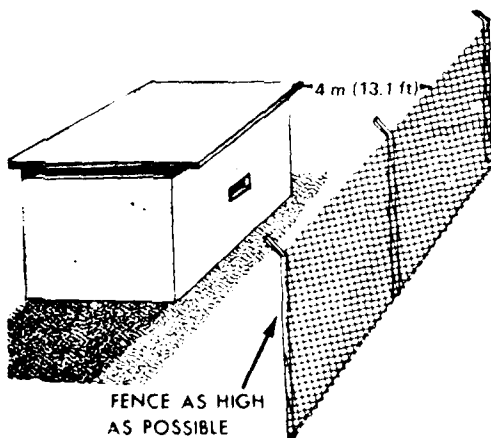
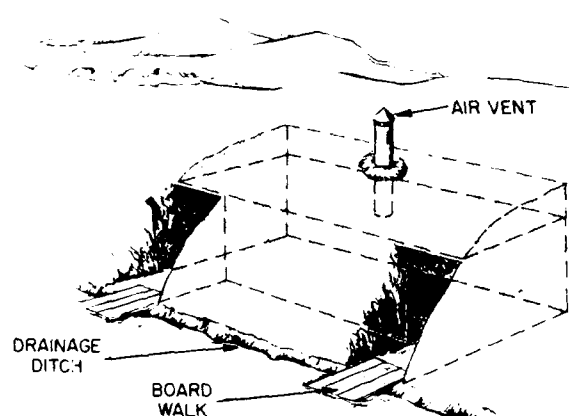


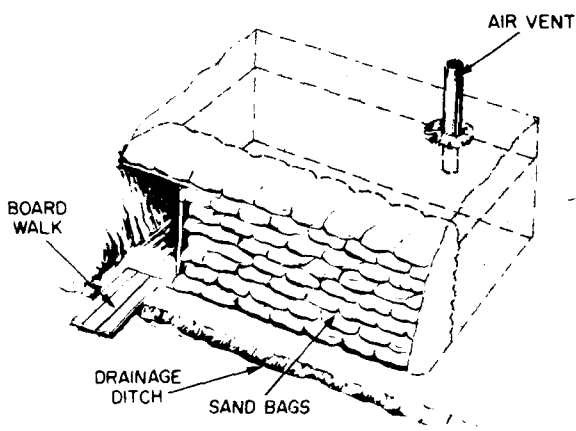
Figure 9-16.—Chain link fence standoff.

location for cut-and-cover shelters is on the reverse slope of a hill, mountain, ridge, or steep bank, as shown in figure 9-17. This shelter provides 6 to 7 feet of headroom. Build the shelter frame in the excavation; backfill the spoil around and over the frame to ground level, or somewhat above, and camouflage it. The protection offered depends on the type of construction (size of timbers) and the thickness of the overhead cover. As in the case of a surface shelter of similar construction, approximately 18 inches of earth cover can be supported.

Cave Shelters. Caves are dug in deliberate defensive positions, usually by tunneling into hillsides, cliffs, cuts, or ridges, or excavating into



CUT-AND-COVER SHELTER IN A HILLSIDE (BAFFLE WALL OF ENTRANCE CAMOUFLAGE OMITTED) SHADED AREA AND BROKEN LINES SHOW CUT-AND-FILL SECTION.



CUT-AND-COVER SHELTER IN A CUT BANK SHOWING SAND-BAGGED OUTER WALL. SHADED AREA AND BROKEN LINES SHOW AREA OF CUT-AND-FILL.

Figure 9-17.—Cut-and-cover shelter.

flat ground. Because of the undisturbed overhead cover, a cave is the least conspicuous of all types of shelters if the entrance is covered. One of the best locations for a supply cave entrance is shown in figure 9-18. The disadvantages of cave shelters include the following:

- Limited observation
- Congested living conditions

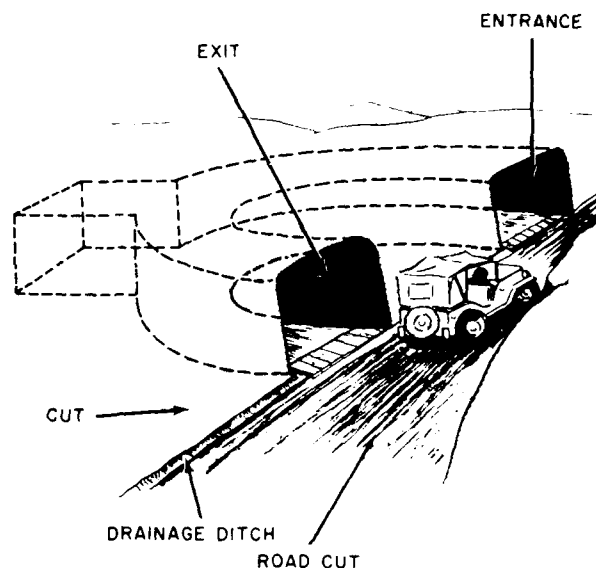


Figure 9-18.—Supply cave in a road cut.

- Small exits
- Difficult drainage and ventilation
- Construction is difficult and time-consuming
- Exits can be blocked or shoring crushed by a direct hit from a conventional weapon or ground shock from a nuclear explosion

SPECIALTY BUNKERS

The construction and location of a deliberate bunker is often affected by its intended use. The following is a list of specialty bunkers.

Observation Posts

Locate observation posts on terrain features offering as good a view as possible of enemy-held areas (fig. 9-19). The ideal observation post has at least one covered route of approach and cover as well as

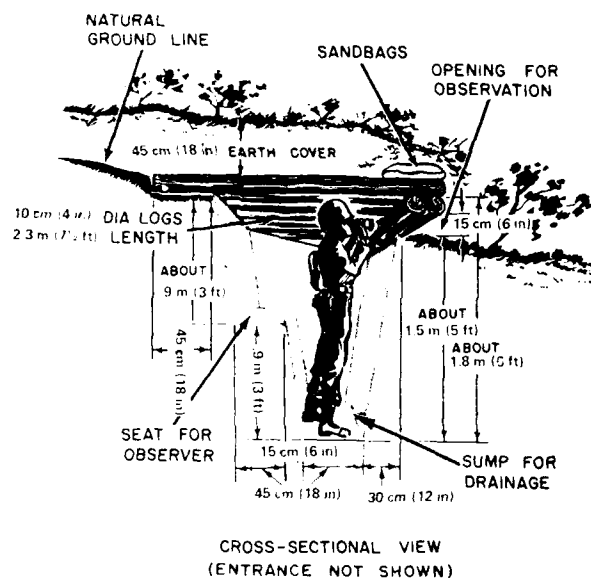


Figure 9-19.—Observation post.

concealment, while offering an unobstructed view of enemy-held ground.

Command Posts

Locate small unit command posts in woods, in ravines, in basements of buildings, or in former enemy fortifications. When none of these are available, surface or cut-and-cover shelters previously described may be modified for this purpose.

Medical Aid Stations

Cut-and-cover shelters are especially adaptable as aid stations since they are easily cleaned and ventilated. Suitable sites may be found in pits, in quarries, under banks, in small buildings, and in ruins.

Ammunition Shelters

Locate and construct ammunition shelters so they protect ammunition against the weather and

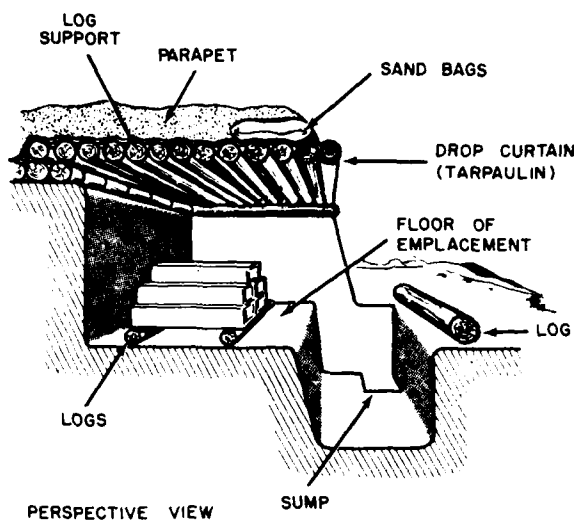


Figure 9-20.—Ammunition shelter.

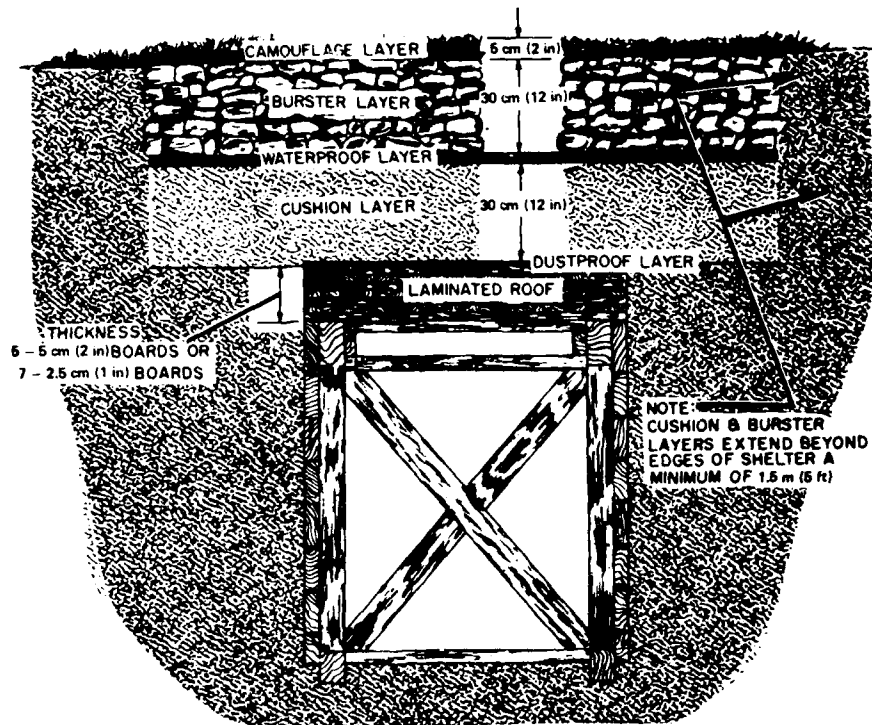
enemy fire. They should be well concealed and large enough to hold the desired quantity of ammunition close to the firing position. Figure 9-20 shows an ammunition shelter which may be constructed in an emplacement parapet. If you need to construct ammunition shelters above ground, particularly where the water level is close to the surface, a log crib built up with dirt is suitable.

HEAVY OVERHEAD COVER

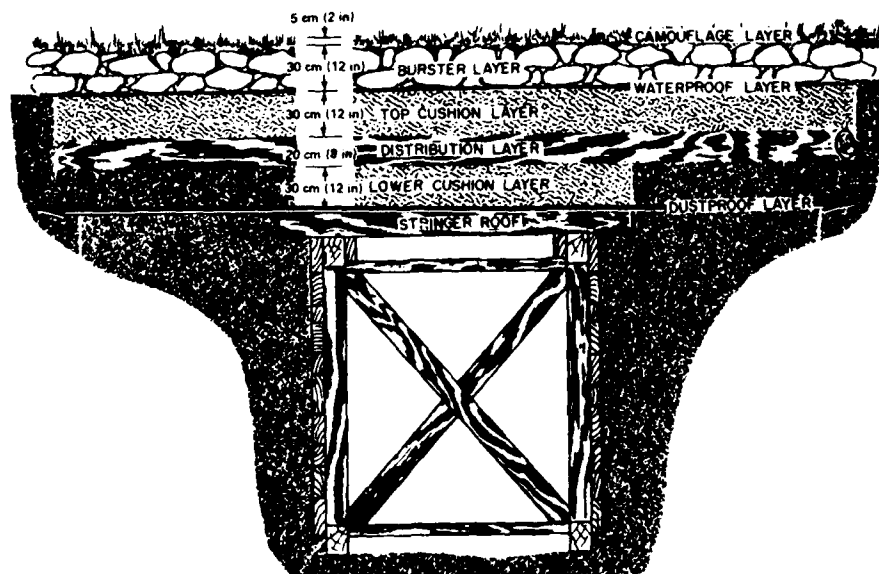
To provide adequate protection against both penetration and detonation of artillery shells and bombs, a structure would require an overhead earth cover so thick that it would be impracticable. By combining materials and using them in layers in a logical sequence, you can provide the required protection with less excavation and construction effort. Figure 9-21 shows two designs of overhead cover in functional layers that protect against the penetration and explosion from a 155-mm artillery round. These two designs, laminated and stringer roof construction, are discussed below.

Laminated Roof Construction

In this design, use either five 2-inch or seven 1-inch layers of lumber for the laminated roof,



A LAMINATED ROOF CONSTRUCTION



B STRINGER ROOF CONSTRUCTION

Figure 9-21.—Heavy overhead cover.

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as shown in figure 9-21, view A. Add the following five layers to the top of the laminated roof in the order indicated.

1. **Dustproof layer.** Use tar paper, canvas, or tarpaulins lapped and placed above the laminated roof to prevent dust and dirt from shaking down on equipment, weapons, and personnel.

2. **Cushion layer.** Add the cushion layer to absorb the shock of detonation or penetration. Untamped earth is the best material for this purpose and should be at least 12 inches thick. Materials such as loose gravel transmit excessive shock to the layer below and should not be used in the cushion layer. This layer extends on all sides for a distance equal to the depth of the shelter floor below the ground surface or a minimum of 5 feet.

3. **Waterproof layer.** Construct the waterproof layer with the same materials used for the dustproof layer, or use similar materials. It keeps moisture from the cushion layer so that the soft dry earth retains its cushioning effect. It also minimizes the dead load the structure must bear.

4. **Burster layer.** Add the burster layer so that incoming projectiles detonate before they can penetrate into the lower protective layers. Make this layer from 6- to 8-inch rocks placed in two layers with the joints broken. Make this layer at least 12 inches thick. Irregularly shaped rocks are more effective for this purpose than flat rocks. If rocks are not available, use 8-inch logs. The logs must be wired tightly together in two layers. Extend the burster layer on each side of the shelter a minimum of 5 feet.

5. **Camouflage layer.** Cover the burster layer with about 2 inches of untamped earth or sod. A greater thickness of camouflage material will tend to increase the explosive effect.

Stringer Roof Construction

Figure 9-21, view B, shows a stringer roof construction of heavy overhead cover. The construction is similar to laminated roof

construction with the addition of the following two layers:

1. A lower cushion layer 12 inches thick is added on top of the dustproof layer. This layer of untamped earth does not extend beyond the sides of the shelter.

2. A distribution layer consisting of 8-inch timbers is also added. This layer extends beyond each side of the shelter a minimum of 5 feet and rests on undisturbed earth to transmit part of the load of the top layers to the undisturbed earth on each side of the shelter.

Overhead Cover for a Fighting Bunker Emplacement

Figure 9-22 shows the details for the construction of a fighting bunker or an emplacement with a heavy overhead cover. The material requirements for the construction of this bunker are found in table 9-4.

Heavy Overhead Cover Protection

Heavy overhead cover protects personnel against the following weapons:

- 152-mm gun-howitzer
- 122-mm howitzer
- 85-mm gun
- 120-mm mortar
- 82-mm mortar
- 140-mm rocket
- 122-mm rocket

ENTRENCHMENT COVER SUPPORT

Overhead cover is normally supported on the roof of the structure, and the resultant load is transmitted through the caps and posts to the foundation on which the structure rests. You may need, in some instances, to support the roof directly on the earth outside a revetted position. When this must be done, the roof timber should not bear directly on the earth outside the excavation. The added load may cause the wall to buckle or cave in. Instead, the roof structure is carried on timber sills or foundation logs bedded uniformly in the surface at a safe distance from the cut. This distance should be at least one-fourth the depth of the cut and in no case less than

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Table 9-4.—Bill of Materials, Fighting Bunker (Laminated Construction)

No.	Nomenclature	Description	Quantities
1	Roof	5cm x 30cm x 2.11m wood (2" x 12" x 6' 11")	48 pcs
		5cm x 30cm x 4.54m wood (2" x 12" x 14' 11")	14 pcs
2	Sidewalls	15cm x 15cm x 2.42m wood (6" x 6" x 7' 11")	26 pcs
3	Entrance wall	15cm x 15cm x 1.21m wood (6" x 6" x 4' 0")	26 pcs
4	Firing port & entrance door	15cm x 15cm x 30cm wood (6" x 6" x 1' 0")	26 pcs
5	Front & rear walls	15cm x 15cm x 1.51m wood (6" x 6" x 4' 11")	13 pcs
6	Firing port & retaining wall	15cm x 15cm x 1.00m wood (6" x 6" x 3' 3")	8 pcs
7	Side post	15cm x 15cm x 2.85m wood (6" x 6" x 9' 4")	6 pcs
		15cm x 15cm x 1.95m wood (6" x 6" x 6' 5")	2 pcs
8	Sandbags		300 each
9	Roofing paper	9.3 sq m (100 sq ft) rolls	8 each
10	Driftpins	1.25cm x 30cm (1/2" x 12")	210 each
11	Nails	16d	30 lb

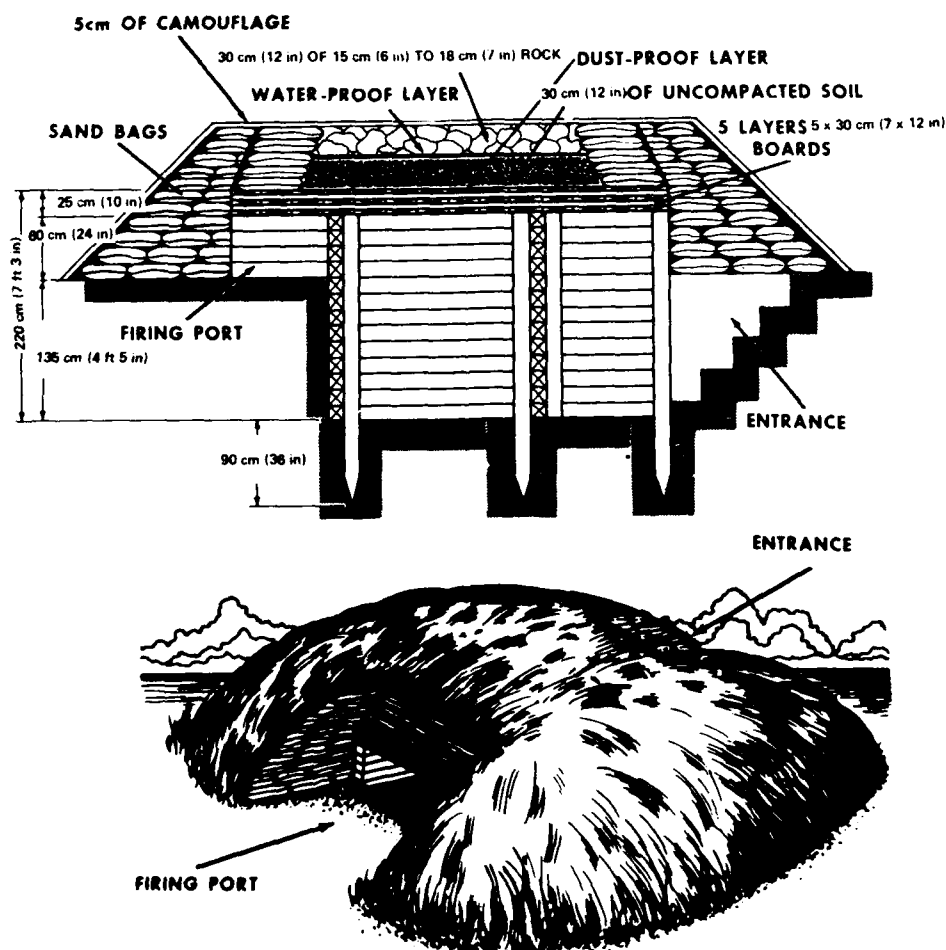
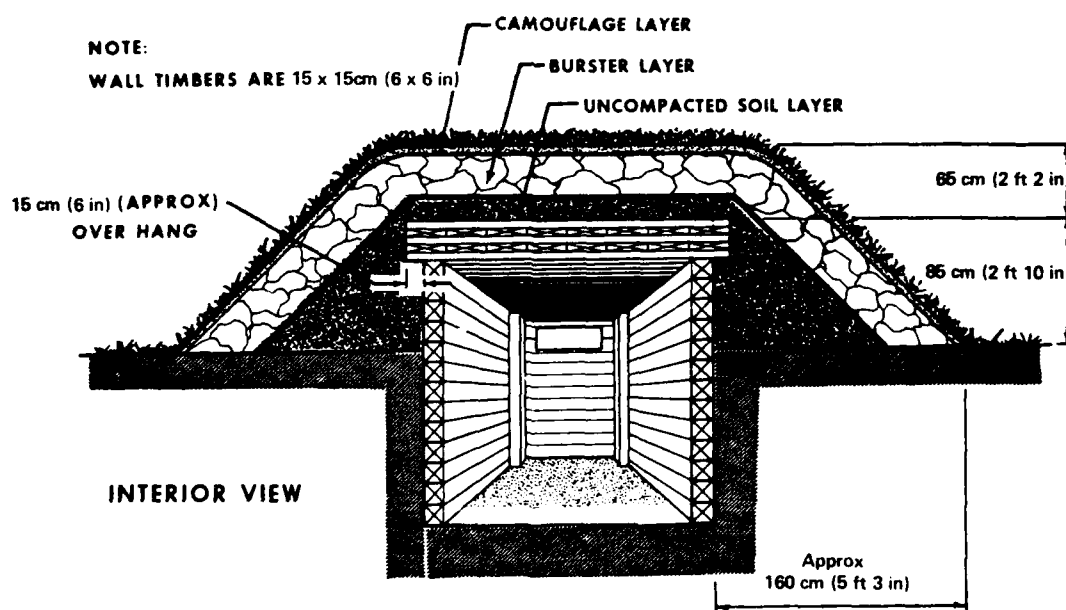


Figure 9-22.—Fighting bunker with heavy overhead cover.

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NOTE:
WALL TIMBERS ARE 15 x 15cm (6 x 6 in)

- CAMOUFLAGE LAYER
- BURSTER LAYER
- UNCOMPACTED SOIL LAYER



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Table 9-5.—Thickness of Laminated Wood Required to Support Various Thicknesses of Earth Cover Over Various Spans

Thickness of earth cover in feet	Thickness in Inches					
	Span width in feet					
	2½	3	3½	4	5	6
1½	1	1	2	2	2	2
2	1	2	2	2	2	3
2½	1	2	2	2	2	3
3	2	2	2	2	3	3
3½	2	2	2	2	3	3
4	2	2	2	2	3	4

Thickness of earth cover in meters	Thickness in Centimeters					
	Span width in meters					
	.75	.9	1.05	1.2	1.5	1.8
.45	2.5	2.5	5.1	5.1	5.1	5.1
.6	2.5	5.1	5.1	5.1	5.1	7.6
.75	2.5	5.1	5.1	5.1	5.1	7.6
.9	5.1	5.1	5.1	5.1	7.6	7.6
1.05	5.1	5.1	5.1	5.1	7.6	7.6
1.2	5.1	5.1	5.1	5.1	7.6	10.2

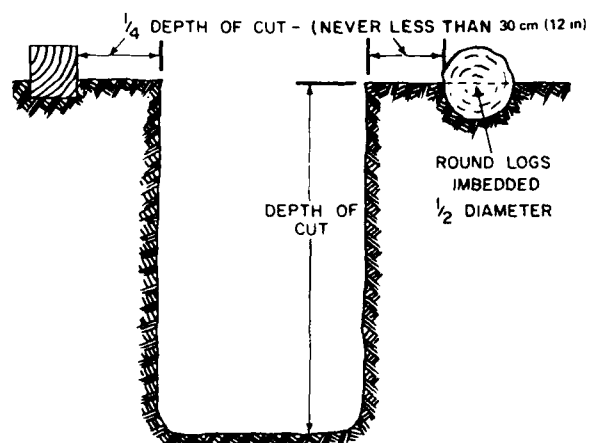


Figure 9-23.—Support of overhead cover on earth banks.

12 inches to the nearest edge of the sill. Embed round logs to at least half their diameter to provide maximum bearing areas of the log to soil. These principles are illustrated in figure 9-23.

Laminated planks or stringers are used to support the roof cover. Table 9-5 shows the

Table 9-6.—Center-To-Center Spacing, in Inches, of Wooden Stringers Required to Support a 1-Inch Thick Wood Roof With Various Thicknesses of Earth Cover Over Various Spans

Thickness of earth cover in feet	Thickness in Inches					
	Span width in feet					
	2½	3	3½	4	5	6
1½	40	30	22	16	10	18*
2	33	22	16	12	8/20*	14*
2½	27	18	12	10	16*	10*
3	22	14	10	8/20*	14*	8*
3½	18	12	8/24*	18*	12*	8*
4	16	10	8/20*	16*	10*	7*

Stringers are 2" by 4" except those marked by an asterisk () which are 2" by 6".

Thickness of earth cover in meters	Thickness in Centimeters					
	Span width in meters					
	.75	.9	1.05	1.2	1.5	1.8
.45	101.6	76.2	55.9	40.6	25.4	45.7*
.6	83.8	55.9	40.6	30.5	20.3/50.8*	35.6*
.75	68.6	45.7	30.5	25.4	40.6*	25.4*
.9	55.9	35.6	25.4	20.3/50.8*	35.6*	20.3*
1.05	45.7	30.5	20.3/60*	45.7*	30.5*	20.3*
1.2	40.6	25.4	20.3/50.8*	40.6*	25.4*	17.8*

See note above.

thickness of laminated plank roof required to support various thicknesses of earth cover. The planks should extend from support to support in all layers, and adjoining edges should be staggered from one layer to the next.

Table 9-6 shows the spacing of stringers required to support a 1-inch plank roof under various thicknesses of earth over various spans. Stringers are 2 by 2 inches unless otherwise indicated.

The roofs shown with the cover indicated are fragment-proof and will give substantial radiation

protection if properly designed entrances are provided.

Sandbags are never used to support overhead cover.

LIGHT OVERHEAD COVER

When you establish positions in wooded areas, it is very important to provide overhead cover to protect personnel from the shrapnel of tree bursts. A fighting bunker with light overhead cover is shown and described in figure 9-24. The overhead cover will stop fragments from tree and airburst

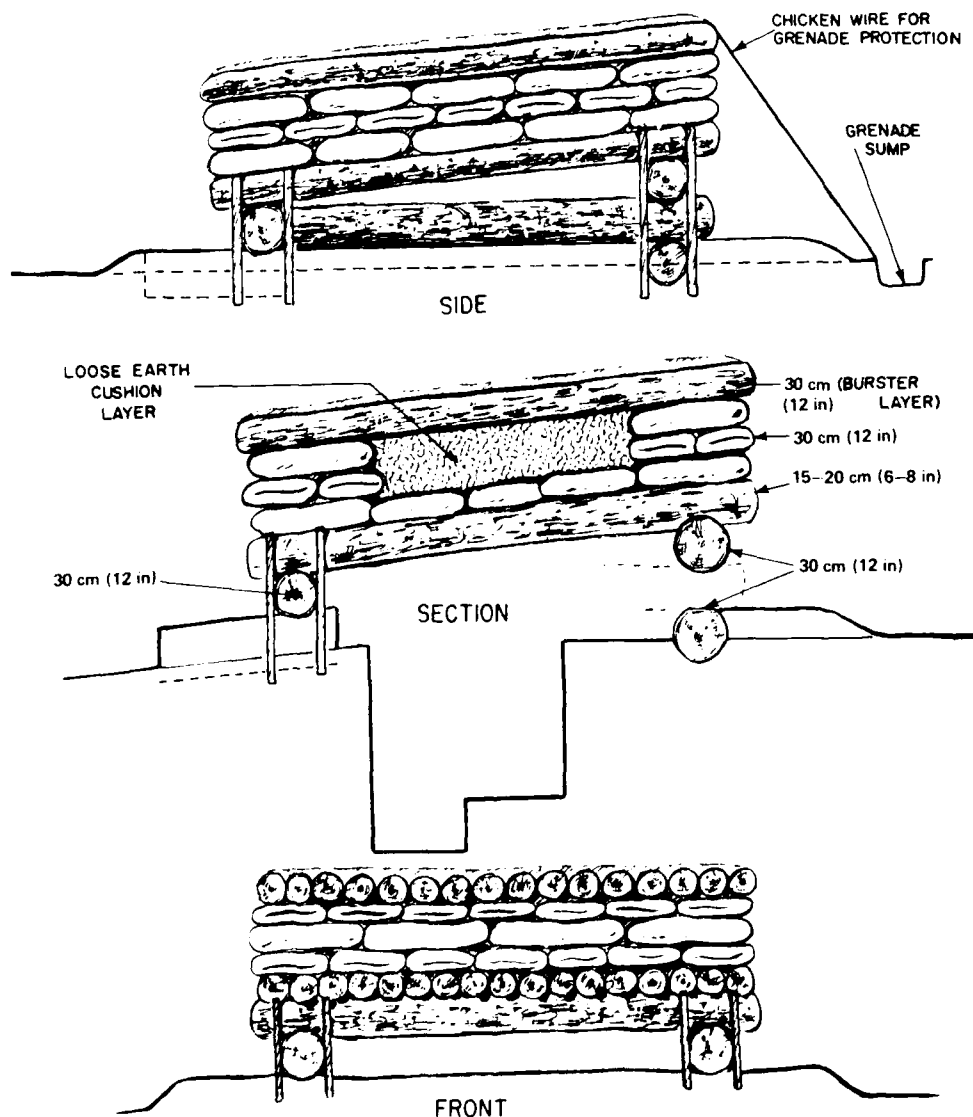


Figure 9-24.—Fighting bunker with light overhead cover.

protected by antipersonnel mines, trip flares, and warning devices.

2. Conceal your entanglements from enemy observation as far as practicable by incorporating terrain features such as reverse slopes, hedges, woods, paths, and fence lines.

3. Erect them in irregular and nongeometrical traces.

4. Employ them in bands or zones wherever practicable.

5. Coordinate the entanglements with other elements of the defense.

CLASSIFICATION

Entanglements are classified according to their use and their depth and whether fixed or portable.

Use

Entanglements are classified by use as tactical, protective, or supplementary. The use of these types in a defensive area is shown schematically in figure 9-26.

Tactical

Site tactical wire entanglements parallel to and along the friendly side of the final protective line. Use them to break up enemy attack formations and to hold the enemy in areas covered by the most intense defensive fire. Extend tactical entanglements across the entire front of a position, but you need not make them continuous.

Protective

Locate protective wire entanglements to prevent surprise assaults from points close to the defense area. As with all antipersonnel obstacles, they are close enough to the defense area for day-and-night observation. They are also far enough away to prevent the enemy from using hand grenades effectively from points just beyond the obstacle, normally 131 to 328 feet. Protective wire surrounds the individual units of a command, usually the platoon (fig. 9-26). Connect these entanglements to entanglements around other platoons by supplementary wire to enclose the entire defensive positions. Erect protective entanglements around rear-area installations in the same manner to serve the same purpose as protective wire around defensive positions in forward areas. Protective wire also includes the entanglements that should be installed over the

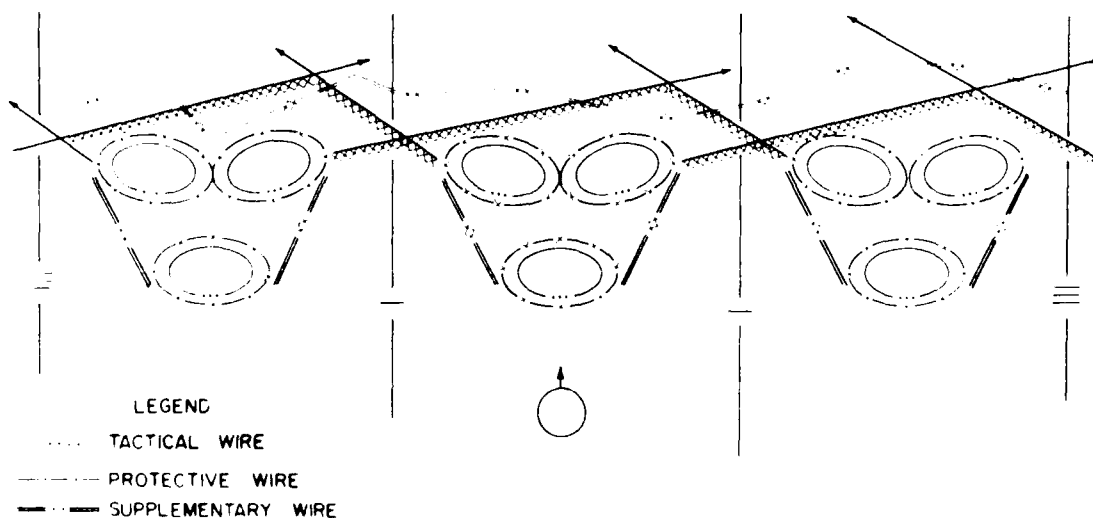


Figure 9-26.—Schematic layout of barbed wire entanglements in a defensive area.



Figure 9-27. —Protective wire on top of overhead cover.

tops of installations provided with overhead cover (fig. 9-27).

Supplementary

Use supplementary wire entanglements in front of the forward edge of the battle area (FEBA) to conceal the exact line of the tactical wire. To the rear of the FEBA, use supplementary wire to enclose the entire defensive position by connecting the protective wire entanglements. Supplementary wire entanglements used to break up the line of tactical wire should be identical to the tactical wire entanglements and constructed simultaneously with them whenever possible.

DEPTH OF ENTANGLEMENTS

Entanglements are classified by depth as belts, bands, or zones.

A BELT is an entanglement one fence in depth.

A BAND consists of two or more belts in depth, with no interval between them. The belts may be fences of the same type, or the band may be composed of two or more fences of different types.

A ZONE consists of two or more bands or belts in depth with intervals between them.

EQUIVALENT EFFECTIVENESS

Entanglement depths are also described or specified in terms of comparative effectiveness. Tactical wire entanglements should be equivalent in effectiveness to three belts of 4- and 2-pace double-apron fence whenever possible. Protective wire may employ any type of entanglement provided its effectiveness is at least the equivalent of that of the 4- and 2-pace double-apron fence. Supplementary wire should have an effectiveness equivalent to that of the type of wire it supplements. It should be equivalent to tactical wire or equivalent to the type of protective wire being used if it connects the outer perimeters of protective wire at the flanks and rear.

PORTABILITY

By definition, fixed entanglements are erected in place and cannot be moved unless completely disassembled.

Conversely, portable entanglements can be moved without complete disassembly. Portable entanglements have been developed for one of the following reasons:

- To permit assembly in rear areas, with ease of transportation and rapid installation in forward positions
- For the temporary closing of gaps or lanes which can be reopened quickly for patrols or counterattacking forces

LANES AND GAPS

Lanes and gaps are provided for the passage of patrols, working parties, and attacking or counterattacking forces. When they are not in use, keep them closed with portable obstacles covered

by fire. In barbed wire zones, stagger lanes and gaps in a zigzag pattern.

USES OF BARBED WIRE ENTANGLEMENTS

The uses of barbed wire entanglements are listed below.

Outpost Area

Surround combat outposts with wire entanglements. Site these entanglements carefully to serve as both protective and tactical wire, and cover them by small arms fire. Supplement the wire obstacle with antipersonnel mines, warning devices, and boobytraps.

Battle Position

In the battle area, surround each company defense position with a wire entanglement, which is connected laterally across the front of the entanglements surrounding the other units in the position.

Artillery and Reserve Area

Use wire entanglements in the outer protection areas of howitzer positions. Similarly protect heavier weapons, reserve area shelters, and other installations in the reserve area if justified by the situation.

Antipersonnel Obstacles

Site barbed wire entanglements, trip flares, noise makers, and antipersonnel mines to detect enemy patrol action or infiltration at night; to prevent the enemy from delivering a surprise attack from positions close to the defenders; and

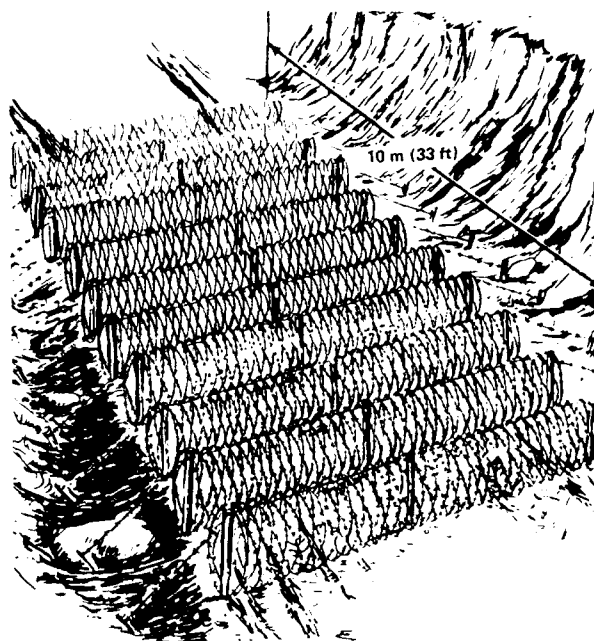


Figure 9-28.—Concertina roadblock.

to hold, fix, or delay the enemy in the most effective killing ground. Site such obstacles near enough to defensive positions for adequate surveillance by the defenders by night and day and far enough away to prevent the enemy from using hand grenades against the defender from points just beyond the obstacles.

Roadblocks

Figure 9-28 shows a series of barbed wire concertinas that will stop wheeled vehicles. Use a series of these blocks placed about 33 feet apart. Wire together the ends of adjacent coils and lightly anchor the obstacle at the sides of the road. Site the block to achieve surprise.

Strengthening Natural Obstacles

Deep rivers, canals, swamps, and cliffs are effective delaying obstacles to infantry, and thick hedgerows, fences, and woods can slow troops to



Figure 9-29.—Standard barbed wire.

a lesser degree. You can improve both of them by lacing the obstacles with barbed wire, by the addition of parts of standard fences on one or both sides, or by entangling with loose wire.

STANDARD BARBED WIRE

Standard barbed wire is a two-strand twisted No. 12 steel wire with 4-point barbs at 4-inch intervals (fig. 9-29).

Handling

When handling barbed wire, wear the standard barbed wire gauntlets, shown in figure 9-29, or heavy leather gloves. They permit faster work and protect against cuts and scratches. As an added safety precaution, grasp the wire with your palms down.

Issue

Barbed wire is issued in reels (fig. 9-30) containing about 1312 feet of wire. The wire weighs 90 pounds and the reel about 1.3 pounds. When building a fence, two men carry one reel.

Bobbins

Bobbins (fig. 9-31) holding about 98 feet of wire are prepared, normally in rear areas, for use in building short lengths of fence and in repairing entanglements. When bobbins are used, two men handle one bobbin. One unwinds the bobbin while

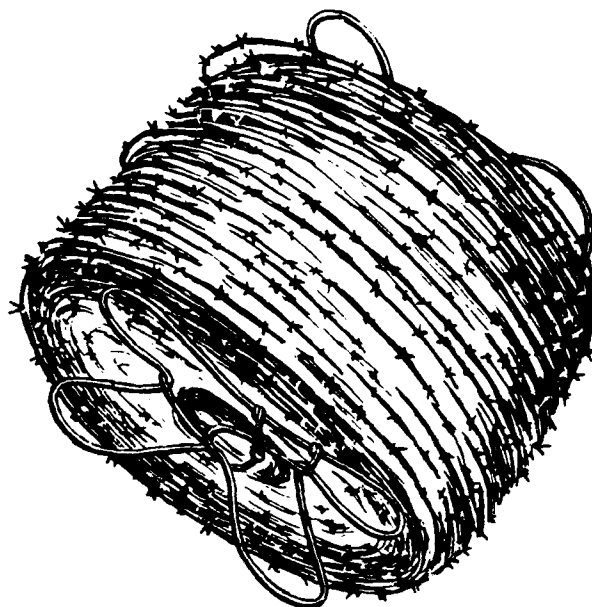
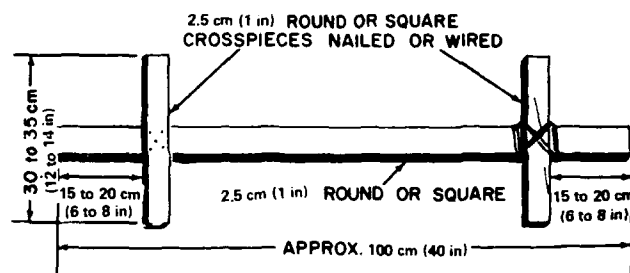


Figure 9-30.—Barbed wire reel.



① METHOD OF MAKING BOBBIN



FREE END MARKED WITH WHITE TAPE

② COMPLETED BOBBIN

Figure 9-31.—Barbed wire bobbin.

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the other installs the wire. Two or more men can make the bobbins by following these instructions:

1. Prepare the bobbin sticks.
2. Rig the reel on an improvised trestle or other support.
3. Have one man unroll and cut 98-foot lengths of wire, fastening one end of each to the trestle.
4. Wind the wire in a figure eight shape on the bobbin sticks.
5. Tie a piece of white tracing tape to the loose end of the wire to facilitate finding it.

BARBED STEEL TAPE

The physical characteristics of barbed tape (fig. 9-32) are as follows:

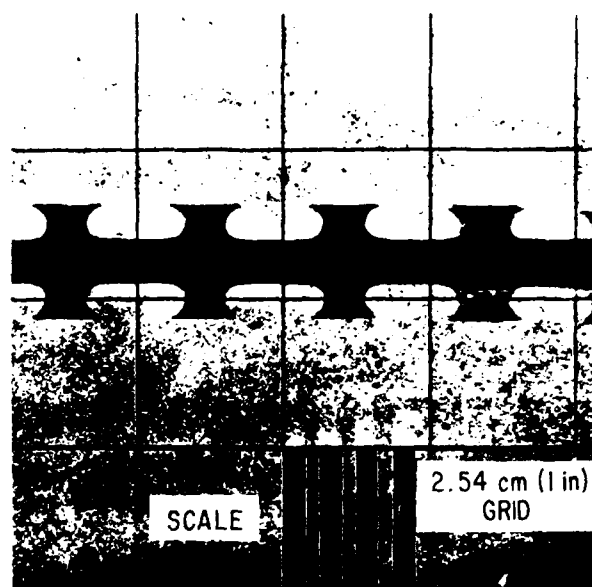
Width: 3/4 inch
 Thickness: 0.022 inch
 Weight: 4.438 pounds/164 feet
 Width of barb: 7/16 inch
 Interval between barbs: 1/2 inch
 Breaking load: 500 pounds

Two significant characteristics listed above which are important to field users are the weight and the breaking load. A comparison of pertinent characteristics of barbed tape and barbed wire is shown below:

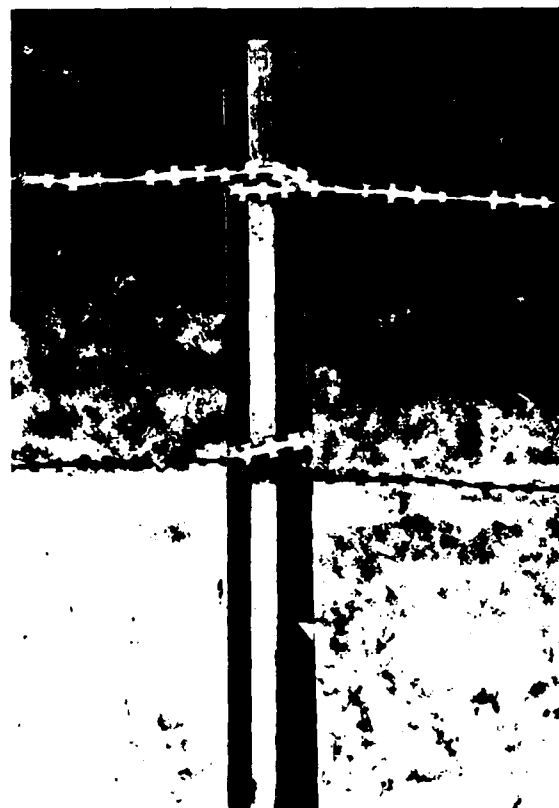
CHARACTERISTIC	BARBED TAPE	BARBED WIRE
Weight (1,312 feet)	35.5 pounds	104.5 pounds
Breaking load	270.0 pounds	1,075.0 pounds
Barbed interval	1/2 inch	4 inches
Size (9,900 feet)	18 5/8 ×	27 × 27 ×
	19 1/2 ×	23 inches
	17 1/2-inches	
Cube	3.6 feet ²	9.7 feet ²

Handling

In handling barbed tape, use heavy barbed tape gauntlets instead of the standard gauntlets. Small metal clips on the palm and fingers prevent



BARBED STEEL TAPE



WRAP-AROUND TIE

Figure 9-32.—Barbed steel tape.

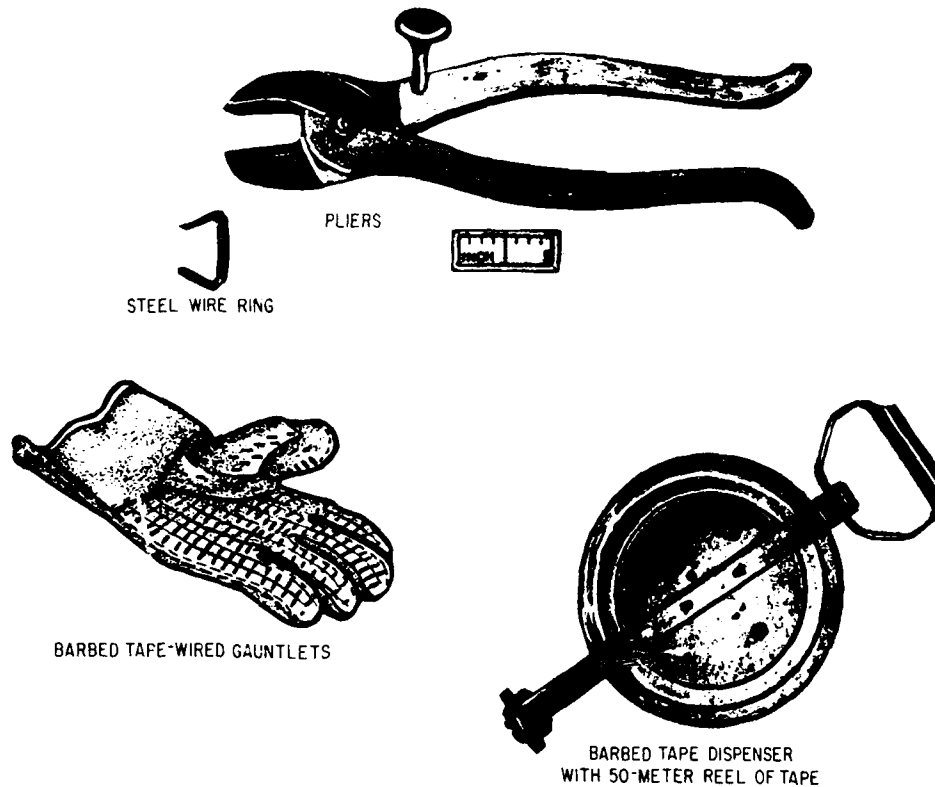


Figure 9-33.—Barbed tape equipment.

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the barbs of the tape from cutting the leather (fig. 9-33). Barbed tape is lightweight and compact, and it is much easier to handle, store, and transport than barbed wire.

Issue

The barbed tape is issued in a 164-foot reel that weighs about a pound. There are six reels to a cardboard carrying case.

Barbed Tape Dispenser

A dispenser (fig. 9-33) is required to install barbed tape. It consists of a frame to hold the 164-foot reel of barbed tape and two sets of rollers. Insert the reel on the spindle and thread the tape through the two sets of parallel rollers. Then turn the outside set of rollers 90° in a

clockwise direction. Now close the hinged arm of the frame and lock it in place by the frame of the rotating rollers. As the tape unwinds from the reel, the two sets of rollers oriented 90° to each other impart a twist to the tape. For it to be effective, you must twist the barbed tape as it is installed.

Uses

You can use barbed tape in place of standard barbed wire in most all cases except when it is to be repeatedly recovered and reused. The most effective fence that you can construct using barbed tape is the double-apron fence (discussed below).

ADVANTAGES OF BARBED TAPE.—The principal advantages of barbed tape are its size and weight. For equal lengths, barbed tape occupies a third of the space and weighs a third

as much as standard barbed wire. A double-apron fence constructed with barbed tape is more difficult to breach by crawling through than one constructed with standard barbed wire because the barbs of the barbed tape are closer together. Because of the flat configuration, it is more difficult to cut barbed tape with wire cutters.

DISADVANTAGES OF BARBED TAPE.—

At the present time, the major disadvantage of barbed tape is the breaking strength. Standard barbed wire is twice as strong. Installation of barbed tape requires a dispenser. A major problem could arise if the dispenser is not available. The tape is not recoverable to its original condition. However, it may be recovered on bobbins in the twisted condition. Barbed tape is more easily cut by shell fragments than standard barbed wire. Barbed tape can also be cut with a bayonet.

Double-Apron Fence

The standard double-apron fence is one of the best obstacles that can be made with barbed tape. The effectiveness of this obstacle is increased by (1) raising the top wire to preclude crossing the obstacle by stepping over it and (2) placing low wires 4 inches above the ground to prevent personnel from crawling under the obstacle.

Tying Procedures

In tying barbed tape, use the wrap-around tie (fig. 9-32), since the sharp bends of other ties weaken the tape. Steel wire rings, crimped on provide effective ties and may be used where available (fig. 9-33).

Splices

Connecting slots at each end of a 164-foot reel provide a quick method of splicing reels of barbed tape (fig. 9-34). You can also splice barbed tape by interlocking the twisted barbs of two separate lengths, then completing the splice by affixing one steel wire ring to each end of the area where spliced (fig. 9-34).

METAL PICKETS

Metal pickets are issued in two types—screw and U-shaped. The standard lengths are short

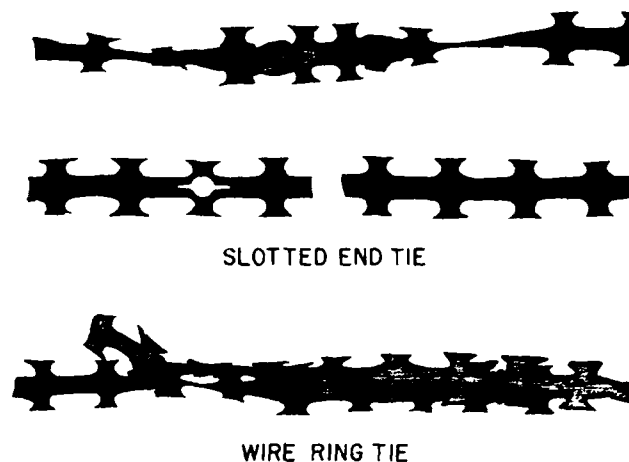


Figure 9-34.—Splicing barbed steel tape.

(or anchor), medium, and long (fig. 9-35). The U-shaped picket also comes in an extra long length. Pickets that are serviceable are recovered and used again.

Screw Pickets

Drive the screw picket into the ground by turning it in a clockwise direction using a driftpin,

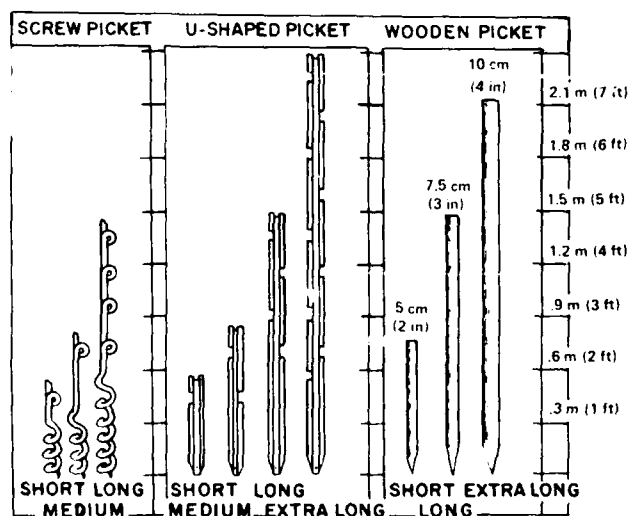


Figure 9-35.—Pickets for use with barbed wire.

stick, or another picket inserted in the bottom eye of the picket for leverage. Use the bottom eye in order to avoid twisting the picket. Install screw pickets so that the eye is to the right of the picket, as seen from the friendly side, and standard ties can be made easily. Screw pickets tend to be less rigid than other types but are desirable because you can install them rapidly and silently. When silence is necessary, wrap the driftpin used in installing the pickets with cloth.

U-Shaped Pickets

The U-shaped picket is a cold-formed steel picket with a U-shaped cross section, pointed at one end for driving. It is notched for wire ties and the pointed end has a punched hole for wires used in bundling the pickets. Drive the U-shaped pickets with a sledge hammer. Use a stake driving cap on the tip of the picket to prevent the sledge from deforming it. Driving the pickets is noisier than installing screw pickets. However, you can reduce the noise by placing a piece of rubber tire over the driving face of the sledge. The pickets are rigid and sturdy when properly installed. They are preferable to screw pickets in situations where noise is not a disadvantage and time is available. Drive the pickets with the hollow surface, or concave side, facing the enemy, so that friendly small arms fire will not ricochet back toward your position. An expedient picket driver which can be locally fabricated is shown in figure 9-36. Constructed as shown, it weighs approximately 5 1/2 pounds and is operated by two men. One man holds the picket in a vertical position while the other slides the driver over the picket and starts it into the ground. Then, both men work the picket driver up and down until the required depth is reached. Drive short pickets by turning the picket driver upside down and using the head as a hammer. Use the bucket of a frontloader to push U-shaped pickets into the ground if the tactical situation permits the use of equipment.

Where frozen ground prevents driving the U-shaped pickets, use an Arctic adapter. The adapter is made of steel and consists of a base plate equipped with an adjustable channel receptacle and two anchor pins. Anchor it by driving the anchor pins through holes in the base plate into the ground. One anchor pin drive sleeve with driving pin is provided with each 20 adapters

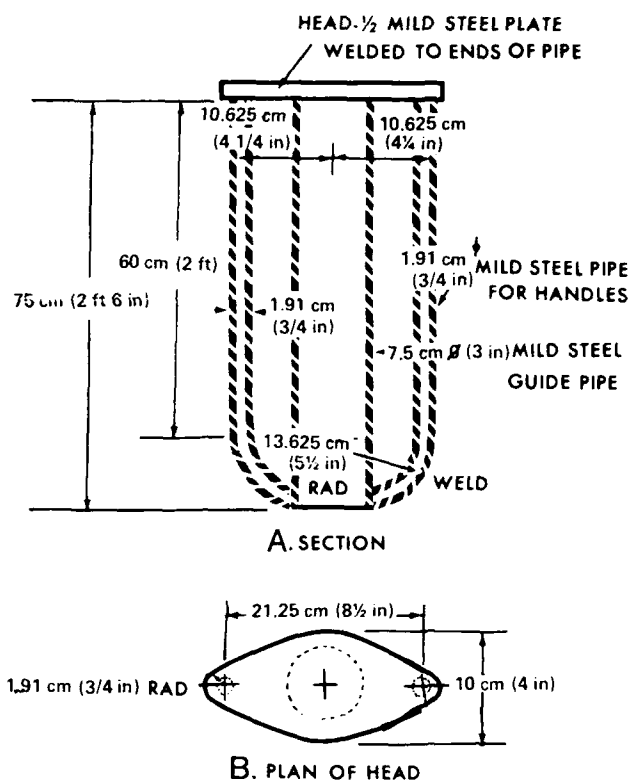


Figure 9-36.—Expedient picket driver.

to aid anchor pin emplacement. When adapters are not available, start a hole with a picket. The picket can be frozen in place by pouring water and snow into the hole.

WOODEN PICKETS

You can use expedient wooden pickets of several types.

Cut round poles 4 inches in diameter to standard picket lengths, sharpen them on one end, and drive them with a maul. Use the pickets without peeling the bark to prevent the wire from sliding on the picket and to simplify camouflage. You need longer pickets in loose or sandy soil or when driving through a snow cover. Driving wooden pickets is not as noisy as driving steel pickets, and you can reduce the noise further by fastening a section of tire tread over the face of the hammer or maul. For driving in hard earth, wrap the picket tops with wire to avoid splitting.

Chapter 9—SHELTERS, BUNKERS, AND ENTANGLEMENTS

Table 9-7.—Wire and Tape Entanglement Materials

Material	Approximate weight		Approximate length		No. carried by one man	Approximate weight of man-load	
	kg	lb	meters	feet		kg	lb
Barbed wire reel.....	41.5	91.3	400	1312	1/2	21	46
Bobbin.....	3.5-4.0	7.7-8.8	30	98	4-6	14.5-24.5	32-54
Barbed tape dispenser.....	0.77	1.7	0.45	1.5	20	15.5	34
Barbed tape carrying case.....	14.5	31.9	300	984	1	14.5	32
Standard barbed tape concertina.....	14	31.8	15.2	50	1	14	31
Standard barbed wire concertina.....	25.4	55.8	15.2	50	1	25	55
Expedient barbed wire concertina.....	13.5	29.7	6.1	200	1	13.5	30
Screw pickets:							
Long.....	4	8.8	1.6	5.25	4	16.3	36
Medium.....	2.7	5.9	0.81	2.66	6	16.3	36
Short.....	1.8	3.9	0.53	1.75	8	14.5	32
U-shaped pickets:							
Extra long.....	7.25	16	2.4	7.9	3-4	21.8-29.0	26-64
Long.....	4.5	9.9	1.5	4.9	4	18.1	40
Medium.....	2.7	5.9	0.81	2.66	6	16.3	36
Short.....	1.8	3.9	0.61	2.0	8	14.5	32
Wooden pickets:							
Extra long.....	7.7-10.5	16.9-23.1	2.13	7.0	2	15.4-20.8	34-46
Long.....	4-7.25	11.8-15.9	1.6	4.9	3	16.3-21.7	36-48
Short.....	1.4-2.7	3-5.9	0.75	2.5	8	11.0-21.7	24-48

Hardwood pickets, properly installed, are sturdy and rigid.

You can use dimension lumber ripped to a square cross section instead of round poles. This is equally satisfactory except that it is more difficult to camouflage. These pickets may be dipped in camouflage paint prior to driving.

Standing trees and stumps may be used as pickets when their location permits.

Table 9-7 lists information pertaining to materials used in the construction of barbed wire entanglements.

CONCERTINA FENCING

The standard barbed wire concertina (fig. 9-37) is a commercially manufactured barbed wire obstacle made of a roll of single-strand, high-strength, spring-steel wire with 4-point barbs attached at 2-inch intervals. Wires forming the coils are clipped together at intervals so that the concertina opens to a cylindrical shape 16.4 to 49.2 feet long (depending on structure and build of opening) and 3 feet in diameter. The 16.4-foot length prevents smaller enemy personnel from crawling through the wire because the coils are

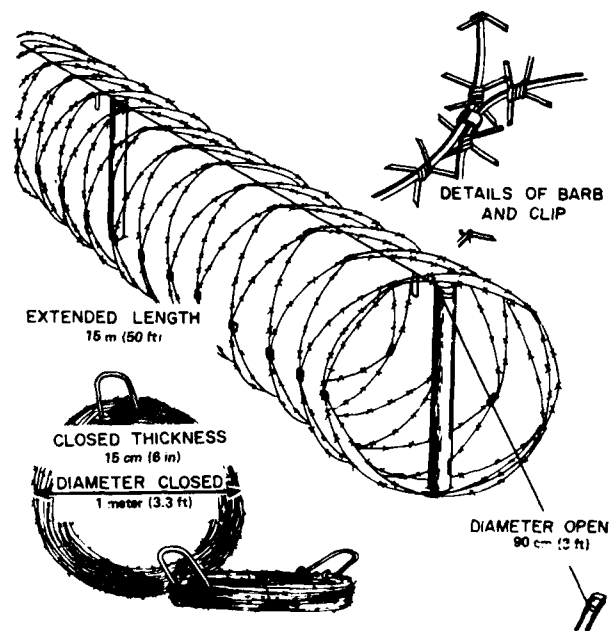


Figure 9-37.—Standard barbed wire concertina.

closer together. Use tanglefoot (discussed later in this chapter) in conjunction with the wire to further increase the barrier's effectiveness. The concertina is easily opened and collapsed, and it can be used repeatedly. The wire is much harder to cut than standard barbed wire. The concertina weighs about 11 1/2 pounds.

HANDLING

The collapsed concertina is tied with plain wire bindings attached to the quarter points of a coil at one end of the concertina. When you open the concertina, remove these bindings and twist them around the carrying handle for use in retying the concertina when it is again collapsed. You need four men to open a concertina and to extend it to the 16.4- to 49.2-foot length. Place one man to work at each end and the other two spaced along its length to ensure that it opens and extends evenly. When necessary, two men can easily open a concertina by bouncing it on the ground to prevent snagging as they open it.

Two men can collapse a concertina in the following manner:

1. First all kinks in coils are removed.
2. Loose clips are then tightened or replaced with plain wire.
3. To close the concertina, one man stands at each end of it and places a foot at the bottom of the coil and an arm under the top of the coil.
4. The two men walk toward each other closing the concertina by feeding the wire over their arms and against their feet.
5. When closed, the concertina is laid flat and compressed with the feet.
6. The concertina is tied with plain wire bindings.

One man easily carries the collapsed concertina by stepping into it and picking it up by the wire handles attached to the midpoints of an end coil.

Use improvised staples, approximately 18 inches long and made of 1/2-inch driftpins or similar material, to fasten the bottoms of concertina fences securely to the ground.

Barbed tape concertina comes in a diameter of 33 inches and an expanded length of 50 feet. It is formed of barbed tape wrapped around a high-strength, spring-steel, core wire. Its configuration, method of handling, and method

of employment are similar to standard barbed wire concertina. One roll weighs only 31 pounds.

ORGANIZATION OF WORK

Table 9-8 lists the materials and man-hours required to assemble various entanglements. The normal sizes of work crews are listed in the descriptions of the entanglements. For each construction project, the senior petty officer divides his crew into groups of approximately equal size, based on his knowledge of the skill and speed of each man. He organizes them in such a way that construction proceeds in proper order and at a uniform rate. Each individual must know exactly what his group is to do and his job in the group. Each man should have barbed wire gauntlets. The sequence of operations for each fence is given in the paragraph describing the erection of the fence. Follow the sequence outlined, and as experience is gained, you may vary the size and composition of the work groups. For each section of entanglement, all fence-building operations normally proceed from right to left, as one faces the enemy. It may, however, be necessary to work from left to right. Men should, if time permits, be taught to work in either direction. In case of heavy casualties, the senior officer or petty officer will decide what wires, if any, are to be omitted.

For night construction, make the following additional preparations:

1. Lay tracing tape from the materials dump to the site of work and then along the line of fence where possible.
2. Tie materials together in man loads and pickets bundled tightly to prevent rattling.
3. Remove and replace wire fastenings of wire coils and pickets with string which can be broken easily.
4. Tie a piece of tape to the ends of the wire on each reel or bobbin.

Proper supervision of entanglement construction includes the following:

1. Organizing the work into tasks
2. Ensuring that the tasks are carried out in the proper sequence
3. Preventing bunching and overcrowding of personnel

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Table 9-8.—Material and Labor Requirements for 984-Foot Sections of Various Barbed Wire Entanglements

Type of entanglement	Pickets				Barbed wire No. of 400 m, 41.5 kg reels ¹	No. of concertinas ⁴	Staples	Kg of materials per lin m of entanglement ²	Lb of materials per lin m of entanglement ²	Man-hours to erect 300 m of entanglement ³
	Extra long	Long	Medium	Short						
Double-apron, 4- and 2- pace		100		200	14-15 (19) ⁵			4.6 (3.5) ⁶	10 (7.7) ⁶	59
Double-apron, 6- and 3- pace		66		132	13-14 (18) ⁵			3.6 (2.6) ⁶	8 (5.7) ⁶	49
High wire (less guy wires)		198			17-19 (24) ⁵			5.3 (4.0) ⁶	11.6 (8.8) ⁶	79
Low wire, 4- and 2-pace			100	200	11 (15) ⁵			3.6 (2.8) ⁶	7.9 (6.1) ⁶	49
4 strand fence		100		2	5-6 (7) ⁵			2.2 (1.8) ⁶	4.8 (3.9) ⁶	20
Double expedient concertina		101		4	3	100	295	6.9	15.1	40
Triple expedient concertina	51	101		7	4	148	295	10.4	22.8	99
Triple standard concertina		160		4	3 (4) ⁵	59	317	7.9 (5.4) ⁶	17.3 (11.8) ⁶	30

¹ Lower number of reels applies when screw pickets are used; high number when U-shaped pickets are used. Add difference between the two to the higher number when wood pickets are used.

² Average weight when any issue metal pickets are used.

³ Man-hours are based on the use of screw pickets. With the exception of the triple-standard concertinas, add 20 percent to the man-hours when driven pickets are used. With experienced troops, reduce man-hours by one-third. Increase man-hours by 50 percent for nightwork.

⁴ Based on concertinas being made up in rear areas and ready for issue. Once expedient concertina opens to 19.7 ft length, as compared with 15 meters for a standard concertina; it requires 302 feet of standard barbed wire, also small quantities of No. 16 smooth wire for ties.

⁵ Number of 984 ft, 14.5 kg barbed tape carrying cases required if barbed tape is used in place of barbed wire.

⁶ Kgs of materials required per linear meter of entanglement if barbed tape is used in place of barbed wire and barbed tape concertina is used in place of standard barbed wire concertina.

4. Ensuring that the wires are tightened properly and spaced correctly

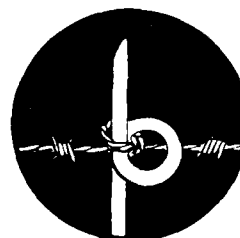
5. Checking ties to see that they are being made correctly and at the right points

When working in close proximity to the enemy, the necessary precautions include the following:

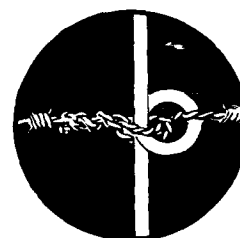
1. Providing security around the work party
2. Maintaining silence
3. No working on enemy side of fence unless absolutely necessary
4. Using screw pickets, if available
5. Men not working should lie down near start of work until they can continue their work
6. Keeping individual weapons nearby at all times

TIES FOR ASSEMBLING ENTANGLEMENTS

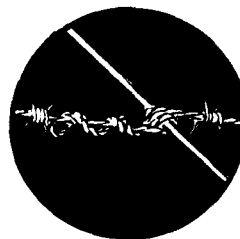
Wires are tied to pickets by men working from the friendly side of the wire and picket, stretching the wire with the right hand as the tie is started. The four ties used in erecting wire entanglements are shown in figure 9-38.



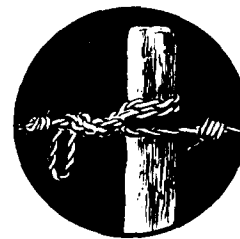
TOP-EYE TIE



INTERMEDIATE-EYE TIE



APRON TIE



POST TIE

Figure 9-38.—Ties for erecting entanglements as seen from friendly side.

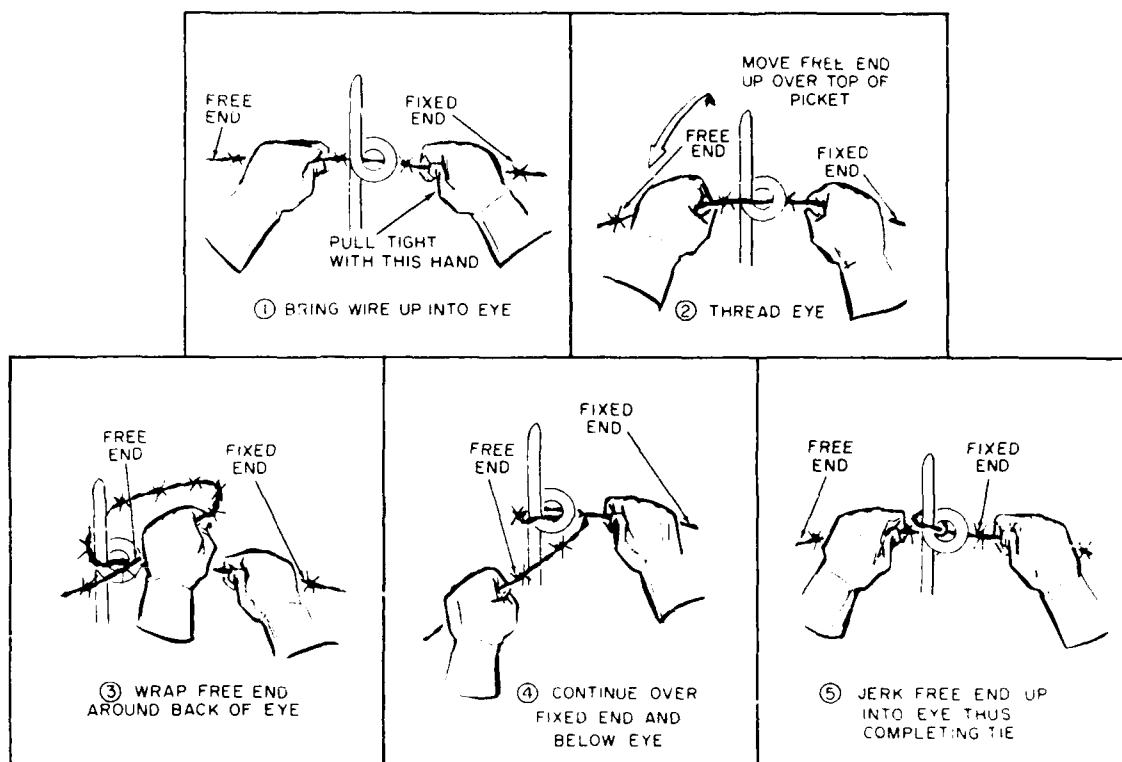


Figure 9-39.—Top-eye tie.

Top-Eye Tie

Use the top-eye tie to fasten standard barbed wire to the top eye of screw pickets. Make the top-eye tie with one continuous movement of the left hand (fig. 9-39) while the right hand exerts a pull on the fixed end of the wire. This is a secure tie, it is quickly made, and it uses only a short piece of wire.

Intermediate-Eye Tie

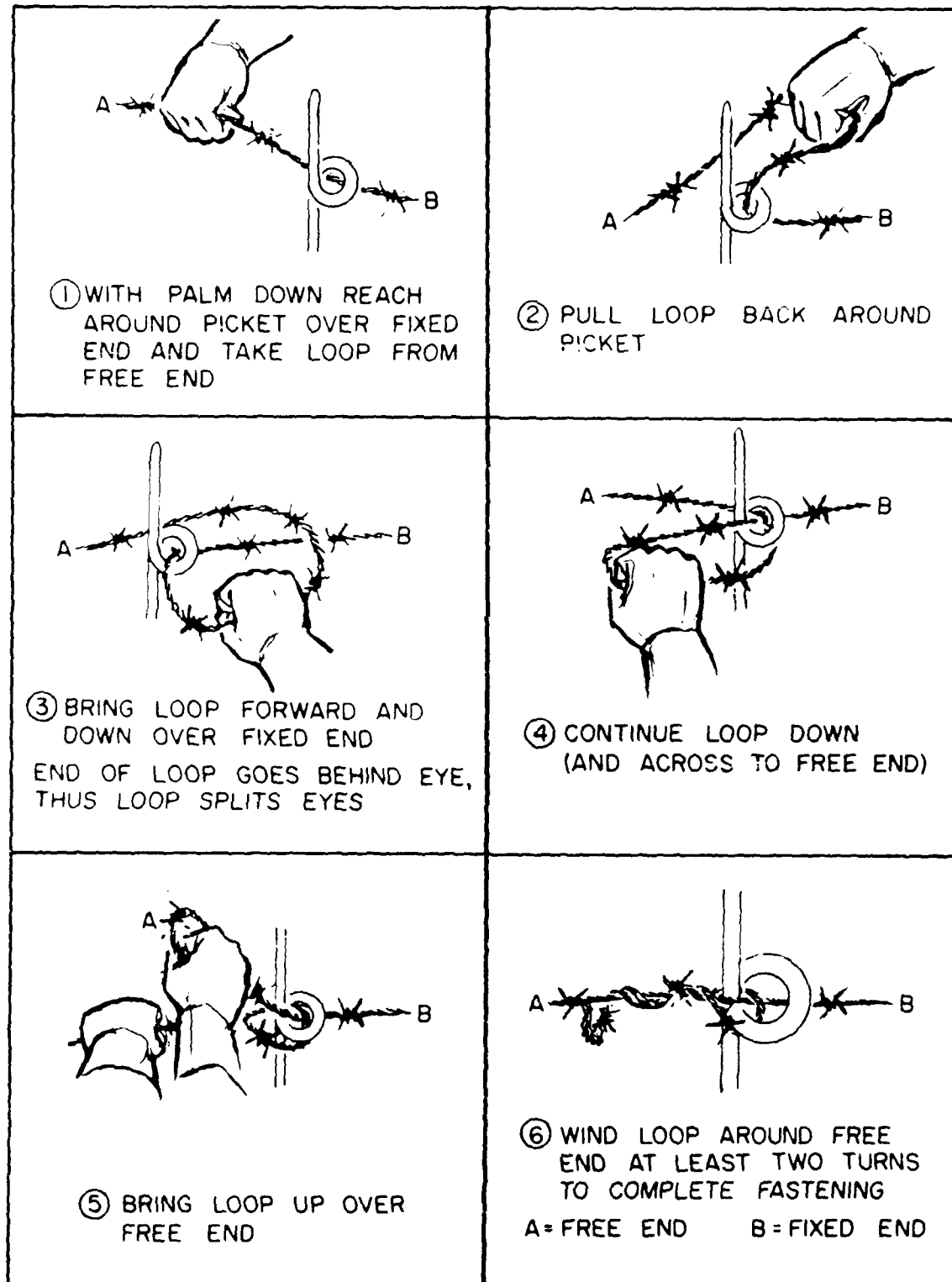
Use the intermediate tie to fasten standard barbed wire to eyes other than the top eye in screw pickets. Make it as shown in figure 9-40. This tie and the other ties described below require more time to make than the top-eye tie and each uses several inches of

wire. In making the intermediate-eye tie shown in figure 9-40, the following points are especially important:

1. The right hand reaches over the fixed wire and around the picket with the palm down. The left hand holds the fixed end for tension.
2. The loops are removed from the free end and wrapped around the picket.
3. One side of the loop should pass above the eye and the other side below the eye.

Post Tie

Fasten standard barbed wire to wooden pickets or to the steel U-shaped picket with the



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Figure 9-40.—Intermediate-eye tie.

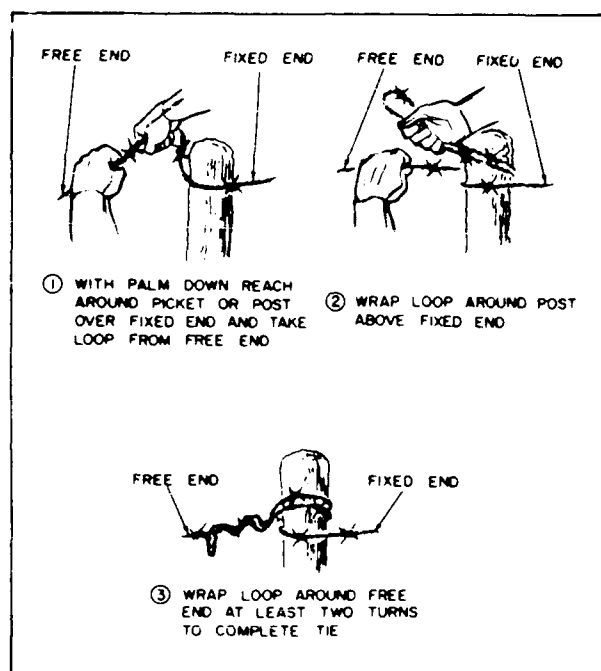


Figure 9-41.—Post tie.

post tie shown in figure 9-41. Wrap the wire tightly around the post to keep the barbs from sliding down. With the U-shaped picket, engage the wire wrapping in a notch in the picket. The method is essentially the same as that of the intermediate-eye tie.

Apron Tie

Use the apron tie whenever two wires that cross must be tied together. Tie it in the same manner as the post tie except that a wire is substituted for the post (fig. 9-42).

Barbed Tape Splices

Connecting slots at each end of a 164-foot reel provide a quick method of splicing reels of barbed tape. You can also splice barbed tape by interlocking the twisted barbs of two separate lengths, then completing the splice by twisting a short piece of wire to each end of the area where spliced.

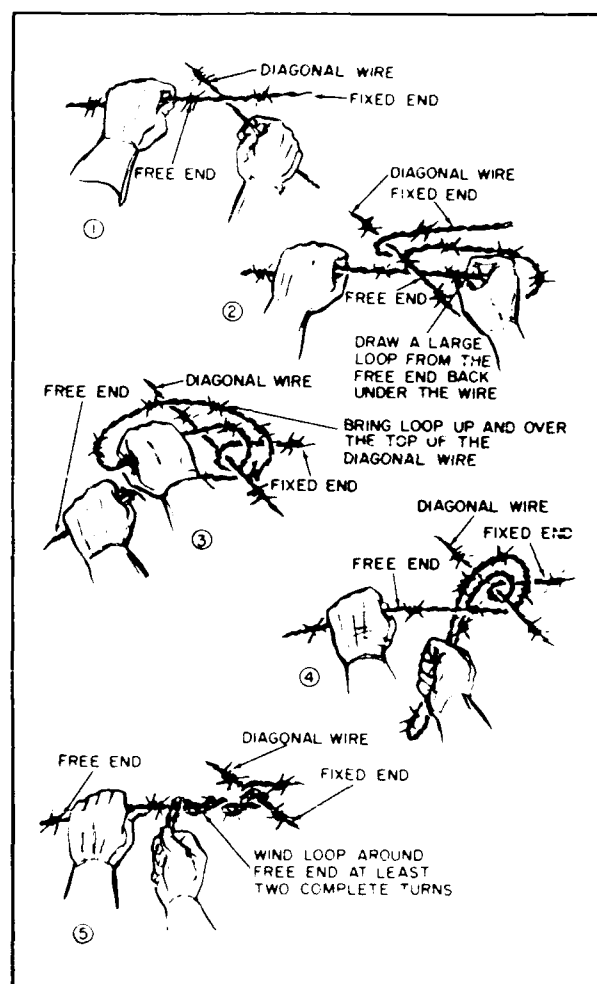


Figure 9-42.—Standard barbed wire apron tie.

INSTALLING WIRES

To install the wires, follow these steps:

1. Attach the end of the wire to the first anchor picket. This is the picket at the right end of a section of entanglement from the friendly side. Build fences from the right to the left as this makes it easier for a right-handed man to make the ties while remaining faced toward the enemy.

2. Insert a bar in the reel and carry the reel 75 to 88 feet allowing the wire to unroll from the bottom. Do this on the friendly side of the row of pickets to which the wire is to be tied.

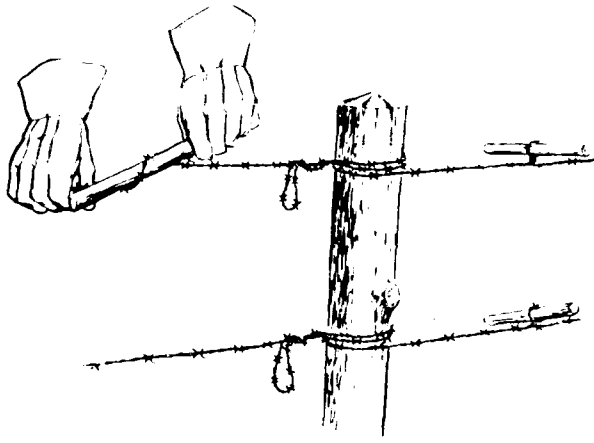


Figure 9-43.—Tightening wire by racking.

3. Put slack in the wire by moving back toward the starting point; then add the ties by two men leapfrogging each other. If available, assign two men to make the ties as the reel is unwound.

After a wire is installed, tighten it, if necessary, by racking with a driftpin or short stick (fig. 9-43). Do not rack wires at ties or where they intersect other wires because this makes salvage of the wire very difficult. Fences are similarly racked to tighten them when they sag after having been installed for some time. Wires should be just taut enough to prevent them from being depressed easily by boards, mats, or similar objects thrown across them. If you stretch the wires too tightly they are more easily cut by fragments. NEVER tighten barbed steel tape by racking.

FOUR-STRAND CATTLE FENCE

The four-strand center section of a double-apron fence can be installed rapidly to obtain some obstacle effect. The aprons can be added later to develop it into a double-apron fence. In country where wire fences are used by farmers, obstacles in the form of four-strand cattle fences (fig. 9-44) will blend with the landscape. Their design should follow as closely as possible the local custom, usually wooden pickets at about 2- to 4-pace intervals with four horizontal strands of barbed wire fixed to them. Site them along footpaths and edges of fields or crops where they

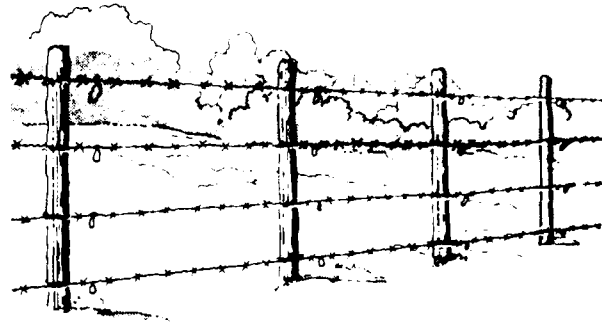


Figure 9-44.—Four-strand cattle fence as viewed from the enemy side.

will not look out of place. If conditions permit, you may improve this fence by installing guy wires in the same manner as the diagonal wires of the double-apron fence. All longitudinal wires of this fence must start and end at an anchor picket.

Phase One

Use 8 men on short sections of this fence and up to 16 men on 984-foot sections. The two operations are (1) laying out and installing pickets and (2) installing wire.

Divide the working party into two groups of approximately equal size. The first group carries and lays out long pickets at 9.8-foot intervals along the center line of the fence. They begin and end the section with an anchor picket and include anchor pickets for guys if needed. The second group installs the pickets.

Phase Two

As the first task is completed, move men individually to the head of the fence and organize them into teams of two or four men to install wires. For four-man teams, two men carry the reel and two men make ties and pull the wire tight. For two-man teams, the wire must first be unrolled for 164 to 328 feet, then the men come back to the head of the work and make the ties, or the wire may first be made up into bobbins to be carried and unwound by one man while the other man makes the ties. The first team installs the bottom fence wire, and draws it tight and close to the ground. Succeeding teams install the next wires in order.

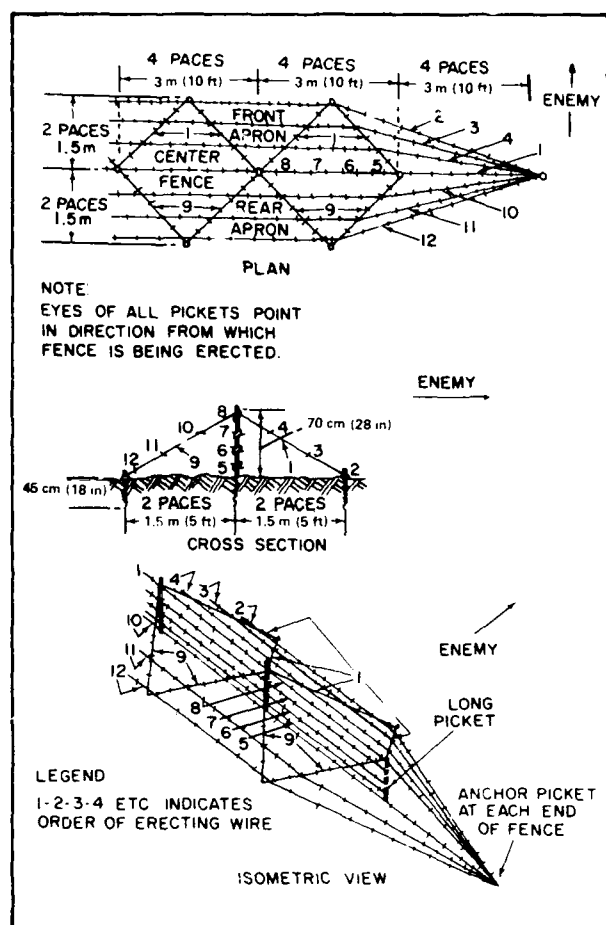


Figure 9-45.—Double-apron fence.

DOUBLE-APRON FENCE

There are two types of double-apron fence, the 4- and 2-pace fence and the 6- and 3-pace fence. The 4- and 2-pace fence (fig. 9-45) is the better obstacle of the two and is the type more commonly used. In this fence the center pickets are 4 paces apart and the anchor pickets are 2 paces from the line of the center pickets and opposite the midpoint of the space between center pickets. The 6- and 3-pace fence follows the same pattern with pickets at 6- and 3-pace intervals. For this fence, less material and construction time are required, but the obstacle effect is substantially reduced because with the longer wire spans it is easier to raise the lower wires and crawl over or under them. Except for picket spacing,

the 4- and 2-pace and the 6- and 3-pace fences are identical. Only the 4- and 2-pace fence is discussed in detail.

A 984-foot section of either type of double-apron fence is a platoon task normally requiring 1 1/2 hours, assuming 36 productive men per platoon. There are two operations in building a double-apron fence: (1) laying out and installing pickets and (2) installing wire. The first operation is nearly completed prior to starting the second. The second operation is started as men become available and the first operation has moved far enough ahead to avoid congestion. A platoon is normally assigned to build a 984-foot section.

Phase One

Divide the working party, if not organized in three squads, into three groups of approximately equal size. One squad lays out the long pickets along the center line of the fence at 4-pace intervals at the spots where they are to be installed and with their points toward the enemy. Another squad lays out the anchor pickets, with points toward the enemy and positioned 2 paces each way from the center line and midway between the long pickets (fig. 9-46). The spacing is readily checked with a long picket. The third squad installs all the pickets, with the help of the two other squads as the latter finish the work of laying out the pickets. When installed, the lower notch or bottom eye of the long pickets should be approximately 4 inches off the ground to make passage difficult either over or under the bottom wires.

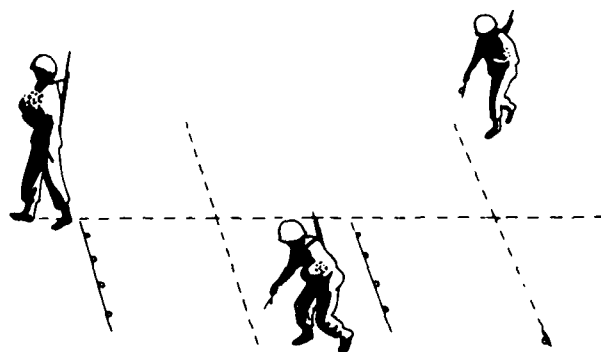


Figure 9-46.—Laying out anchor pickets.

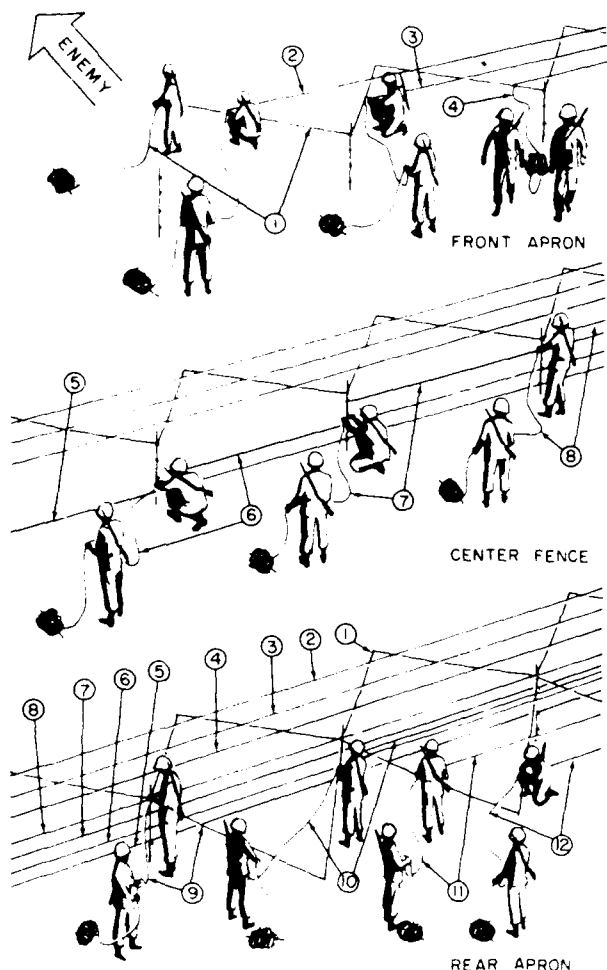


Figure 9-47.—Sequence of installing wire in a double-apron fence.

Phase Two

As the groups complete the first operation, they return to the head of the fence and begin installing wire. The order in which the wires are installed is shown in figure 9-45 and is further illustrated in figure 9-47. Take care to avoid having any of the men cut off between the fence and the enemy. Divide the men into two- or four-man groups and have them proceed to install the wires in numerical order; that is, as soon as the men installing one wire have moved away from the beginning of the fence and are out of the way,

the next wire is started. Installation is as follows:

1. The No. 1 wire is the diagonal wire on the enemy side and is secured with a top-eye tie to all pickets. It is important to keep this wire tight.

2. The No. 2 wire is the tripwire on the enemy side of the fence and is secured to both diagonals just above the anchor picket with the apron tie. This wire must be tight enough and close enough to the ground to make passage over or under the wire difficult.

3. The No. 3 wire is an apron wire on the enemy side of the fence. It is secured to the first diagonal wire, and thereafter to each alternate diagonal, and then to the last diagonal wire. The No. 4 wire is also an apron wire on the enemy side of the fence. It is secured to the first diagonal wire (No. 1), thereafter to the diagonal wires which are not tied to the No. 3 wire, and then to the last diagonal wire. Apron wires No. 3 and 4 are equally spaced along the diagonal wire.

4. The No. 5 wire is the first one that is not started from the end anchor picket. It is started at the first long picket, and ended at the last long picket. It is secured with the intermediate-eye tie and is stretched tightly to prevent passage over or under it.

5. Wires No. 6, 7, and 8 complete the center portion of the fence and are secured to the long picket No. 6 and 7 with the intermediate-eye tie. They also start at the first and end at the last long picket. No. 8 is secured with the top-eye tie. These wires (No. 6, 7, and 8) form the backbone of the fence and are drawn up tightly to hold the pickets in position.

6. Wire No. 9 is the diagonal apron wire on the friendly side of the fence and is secured with the top-eye tie to all pickets. Wire No. 10 and 11 are apron wires, and wire No. 12 is the tripwire on the friendly side of the fence. Wire No. 12 is installed in the same manner as wire No. 2.

7. If the fence is not satisfactorily tight when installed, wires are tightened by racking as described above.

STANDARD CONCERTINA FENCES

As an obstacle, in most situations, the triple standard concertina fence is better than the double-apron fence. The material for it weighs

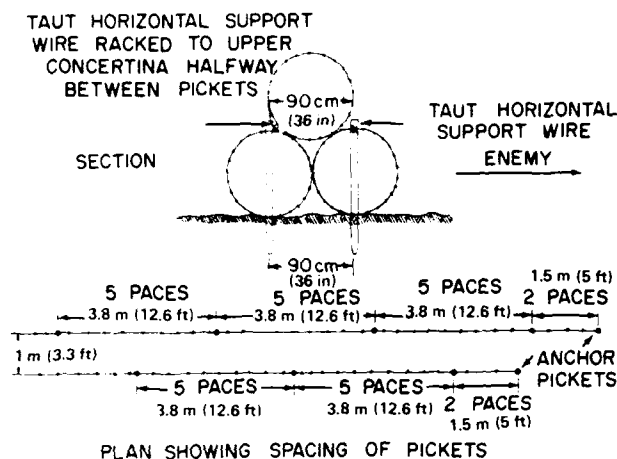


Figure 9-48.—Triple standard concertina fence.

about 50 percent more, but it is erected with about one-half the man-hours. Every concertina fence is secured firmly to the ground by driving staples at intervals of not more than 6.6 feet. The staples are used on the single concertina fence and on the front concertina of the double and triple types. The two types of fence are as follows:

1. **SINGLE CONCERTINA.** This is one line of concertinas. It is erected quickly and easily but is not an effective obstacle in itself. It is used as an emergency entanglement or for the temporary closing of gaps between other obstacles. It is for such purposes that one roll of concertina may be habitually carried on the front of each vehicle in combat units.

2. **DOUBLE CONCERTINA.** This consists of a double line of concertinas with no interval between lines. The two lines are installed with staggered joints. As an obstacle, the double concertina is less effective than a well-emplaced, double-apron fence. It is used in some situations to supplement other obstacles in a band or zone.

TRIPLE STANDARD CONCERTINA FENCE

This fence consists of two lines of concertinas serving as a base, with a third line resting on top, as shown in figure 9-48. All lines are installed with staggered joints. Each line is completed before the next is started so that a partially completed concertina entanglement presents some

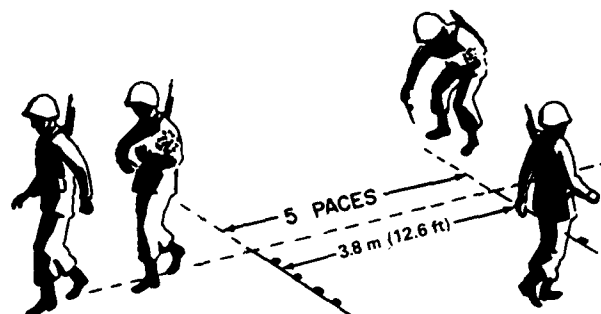


Figure 9-49.—Laying out long pickets for triple concertina fence.

obstruction. It is erected quickly and is difficult to cross, cut, or crawl through.

A 984-foot section of this fence is a platoon task normally requiring less than 1 hour. There are two operations in building this fence: (1) carrying and laying out pickets and concertina rolls and installing concertina fence, and (2) opening and installing concertinas.

Phase One

For the first operation, divide the working party into three groups of approximately equal size: one to lay out all concertina fence, one to install all concertina fence, and one to lay out all concertina rolls.

The first group lays out front row long concertina fence at 5-pace intervals on the line of the fence (fig. 9-49) with points of pickets on line and pointing toward the enemy. The rear row long pickets are then laid out on a line 3 feet to the rear and opposite the center of interval between the front row long pickets. An anchor picket is laid out at each end of each line, 5 feet from the end long picket.

The second group installs pickets beginning with the front row (fig. 9-50). As in other fences, eyes of screw pickets are to the right. Concave faces of U-shaped pickets are toward the enemy.

The third group lays out concertinas along the rows of pickets (fig. 9-51). In the front row, one roll is placed at the third picket and one at every fourth picket thereafter. Sixteen staples accompany each front row concertina. In the second row, two rolls are placed at the third picket and two at every four pickets thereafter. As each roll is placed in position, its binding wires are

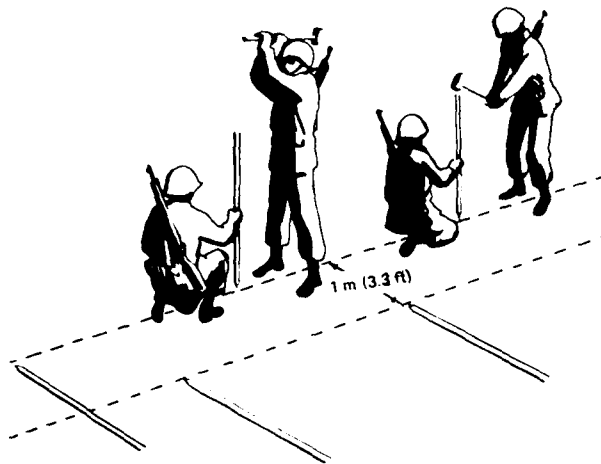


Figure 9-50.—Installing front row pickets for triple concertina fence.

unfastened but are left attached to the hoop at one end of the roll.

Phase Two

As they complete the first operation, organize all men in four-man parties (fig. 9-52) to open and install concertinas, beginning at the head of the fence. The sequence, shown in general in figure 9-52, is as follows:

1. Open the front row concertinas in front of the double line of pickets and the other two in its rear.
2. Lift each front row concertina in turn and drop it over the long pickets, then join concertina ends as shown in figure 9-53.

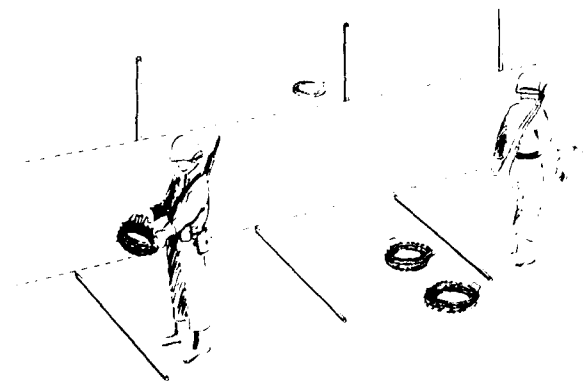


Figure 9-51.—Laying out concertina.

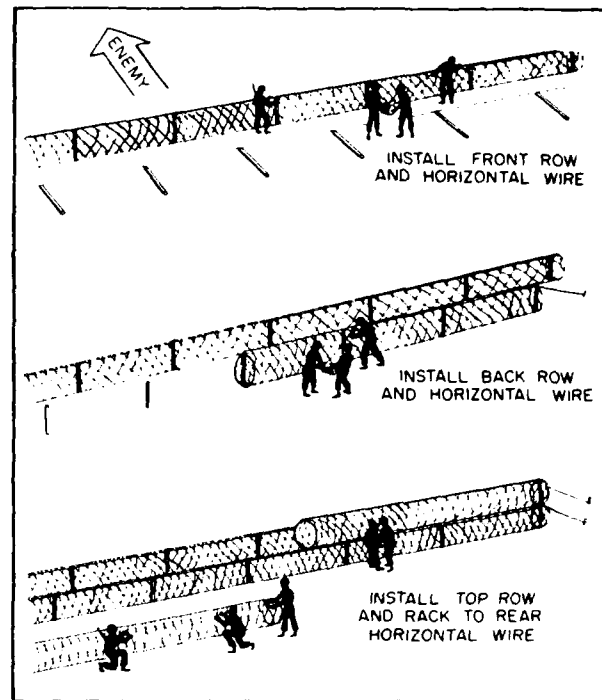


Figure 9-52.—Installing concertina.

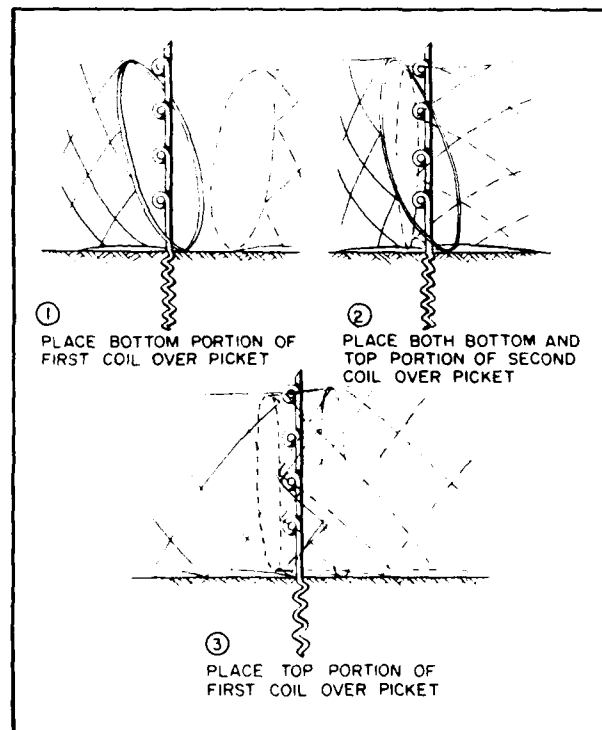


Figure 9-53.—Joining concertina.

3. Fasten the bottom of the concertina to the ground by driving a staple over each pair of end hoops, one over the bottom of a coil at each long picket, and one at the 1/2 and 1/4 points of the 12.5-foot picket spacing. Securing the front concertina to the ground is essential and must be done before installing another concertina in its rear unless the enemy side of the entanglement is sure to be accessible later.

4. Stretch a barbed wire strand along the top of each front row and fasten it to the tops of the long pickets, using the top-eye tie for screw pickets. Stretch these wires as tightly as possible to improve the resistance of the fence against crushing.

5. Install the rear row concertina as described above for the front row concertina.

6. Install the concertina in the top row (fig. 9-52), fastening the end hoops of 50-foot sections with plain steel wire ties. Begin this row at sections with plain steel wire ties. Begin this row at a point between the ends of the front and rear of the lower rows, thus breaking all end joints.

7. Rack the top concertina to the rear horizontal wire at points halfway between the long pickets. If there is safe access to the enemy side of the fence, similarly rack the top concertina to the forward horizontal wire.

LOW WIRE ENTANGLEMENT

This is a 4- and 2-pace double-apron fence in which medium pickets replace long pickets in the fence center line (fig. 9-54). This results in omission of wires No. 6, 7, and 8, and in bringing all the apron and diagonal wires much closer to the ground so that passage underneath this fence is difficult. This fence may be used advantageously on one or both sides of the double-apron fence. The low wire entanglement is used where concealment is essential. In tall grass or shallow water, this entanglement is almost invisible and is particularly effective as a surprise obstacle. However, a man can pick his way through this low wire fence without much difficulty; therefore, for best results it must be employed in depth.

Except for the omission of three wires and the substitution of the medium pickets, this fence is constructed in the same manner as the double-apron fence.

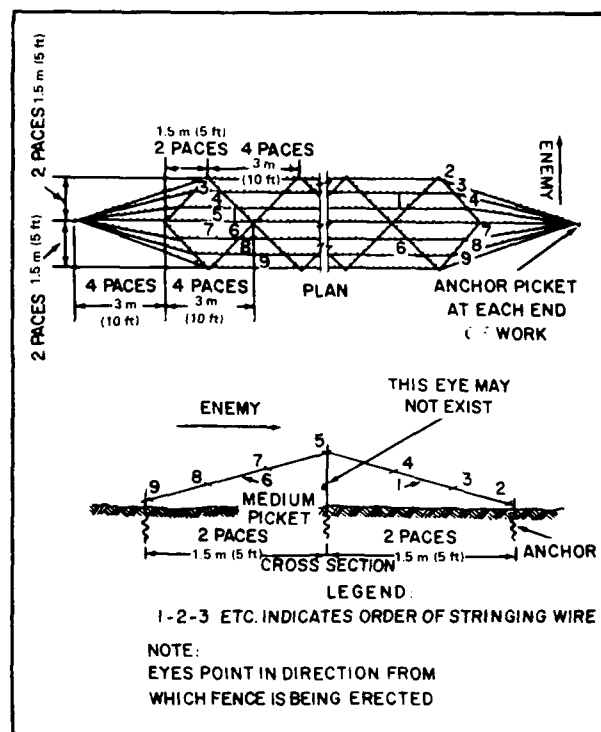


Figure 9-54.—Low wire fence.

HIGH WIRE ENTANGLEMENT

This obstacle consists of two parallel 4-strand fences with a third 4-strand fence zigzagged between them to form triangular cells. With two rows of pickets, as shown in figure 9-55, the entanglement is classed as a belt; with one or more additional rows of fences and triangular cells it is a band. To add to the obstacle effect, install front and rear aprons and place spirals of loose wire in the triangular cells.

A 984-foot section of high wire entanglement with two rows of pickets, as shown in figure 9-55, is a platoon task normally requiring about 2 hours, assuming 38 men per platoon. The two operations are laying out and installing pickets and installing wire.

Phase One

For this operation, divide the working party into two groups: two thirds of the men going to the first group and one third to the second. The first group carries and lays out pickets, front row first and at 10-foot intervals. Second row pickets

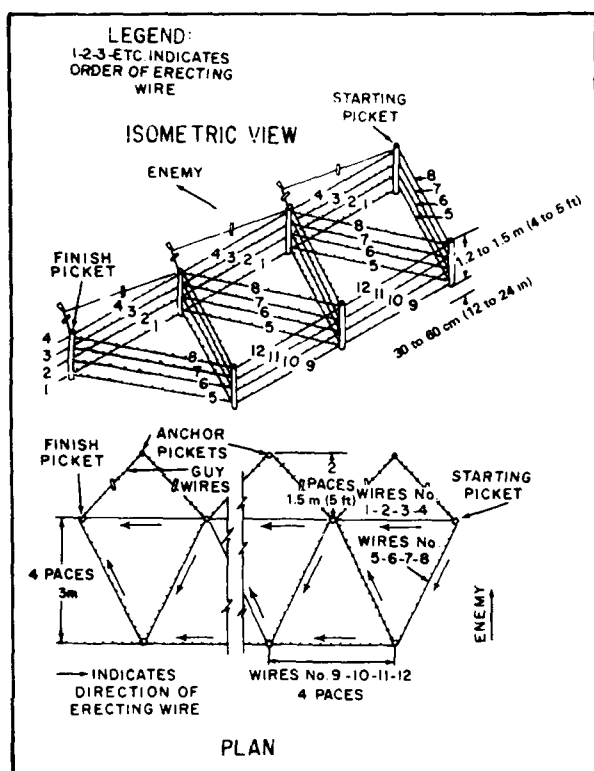


Figure 9-55.—High wire entanglement.

are laid out in a line 10 feet to the rear of the front row and spaced midway between them. The first group also lays out an anchor picket in line with each end of each 4-strand fence, 10 feet from the nearest long picket. If guys are needed, anchor pickets are also laid out in lines 2 paces from the lines of the front and rear fences, opposite and midpoint of spaces between the long pickets. The second group installs front row pickets, returns to the head of the fence, installs the rear row, and then installs the anchor pickets. When the first group finishes laying out pickets, they begin installing wire and help finish installing the pickets.

Phase Two

As the first task is completed, men move individually to the head of the fence and are organized into teams of two or four men to install wires in the same manner as for the 4-strand fence. The order of installation is as shown in figure 9-55, except that if front guys are used they are installed before the No. 1 wire; rear guys after

the No. 12 wire. The lengthwise wires of each 4-strand fence begin and end at an anchor picket.

TRESTLE APRON FENCE

The trestle apron fence (fig. 9-56) has inclined crosspieces spaced at 15.7- to 19.7-foot intervals to carry longitudinal wires on the enemy side. The rear ends of the crosspieces are carried on triangular timber frames which are kept from spreading by tension wires on the friendly side. The crosspiece may be laid flat on the ground for tying the longitudinal wires in place and then raised into position on the triangular frames. The frames are tied securely in place and held by the tension wires. The fence should be sited in such a way that it can be guyed longitudinally to natural anchorages and racked tight.

LAPLAND FENCE

Figure 9-57 shows the Lapland fence which can be used equally well on frozen or rocky ground and on bogs or marshland. This fence is wired with six strands of barbed wire on the enemy side, four strands on the friendly side, and four strands on the base. In snow, the tripods can be lifted out of the snow with poles or other means to reset the obstacle on top of newly fallen snow. On soft ground, the base setting of tripods and the base wires give enough bearing surface to prevent the obstacle from sinking.

PORTABLE BARBED WIRE OBSTACLES

Standard concertinas are readily moved and are well adapted for the temporary closing of gaps or lanes, or for adding rapidly to the obstacle effect of fixed barriers such as the double-apron fence. Other portable barbed wire obstacles are described below.

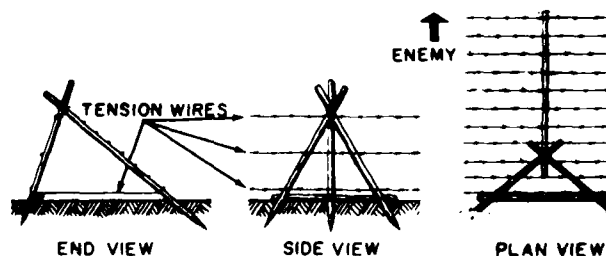


Figure 9-56.—Trestle apron fence.

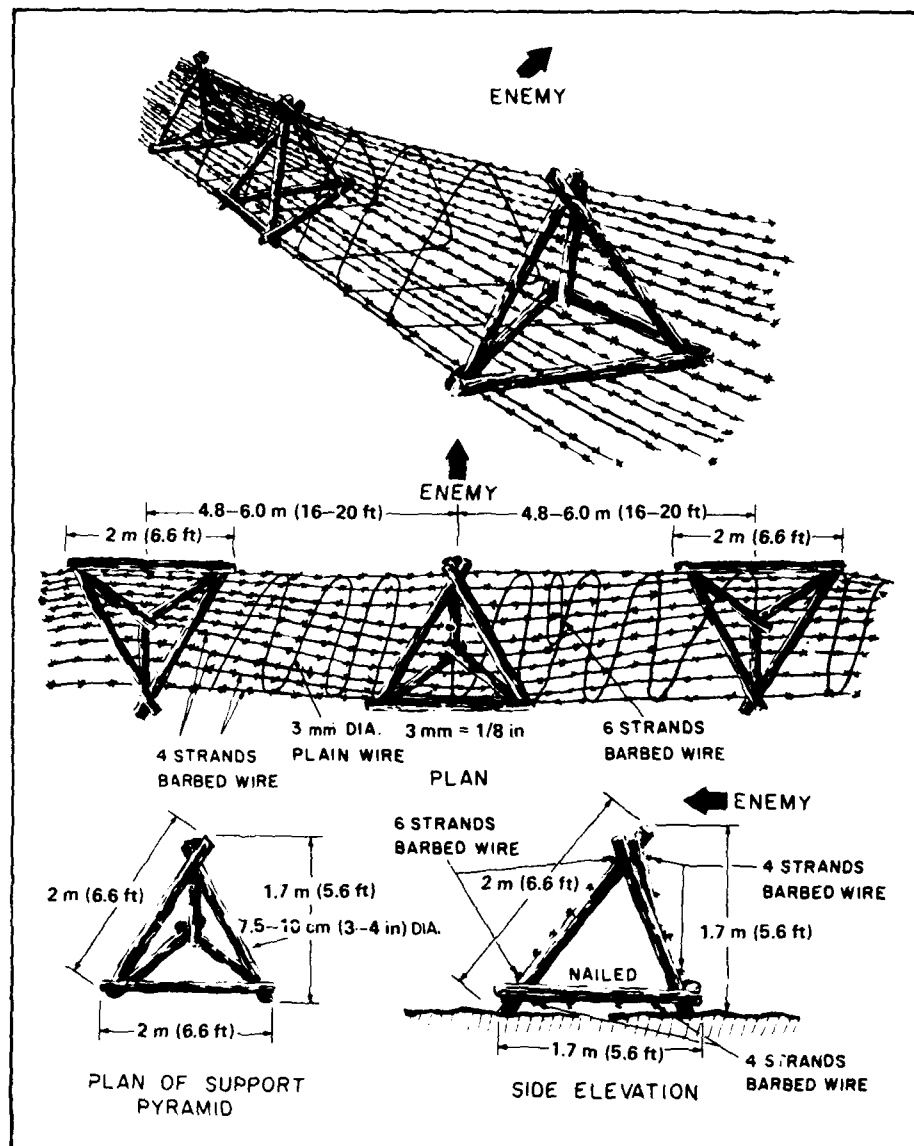


Figure 9-57.—Lapland fence.

Spirals of Loose Wire

By filling open spaces in and between wire entanglements with spirals of loose wire, the obstacle effect is substantially increased. Men are tripped, entangled, and temporarily immobilized. Spirals for such use are prepared as follows:

1. Drive four 3.3-foot posts in the ground to form a diamond 3.3 by 1.6 feet.
2. Wind 246 feet of barbed wire tightly around the frame. Start winding at the

bottom and wind helically toward the top.

3. Remove the wire from the frame and tie it at quarter points for carrying or hauling to the site where it is to be opened and used. One spiral weighs less than 20 pounds and a man can carry three or more of them by stepping inside the coils and using wire handles of the type furnished with the standard concertina.

4. If spirals are needed in large quantities, mount the diamond-shaped frame on the

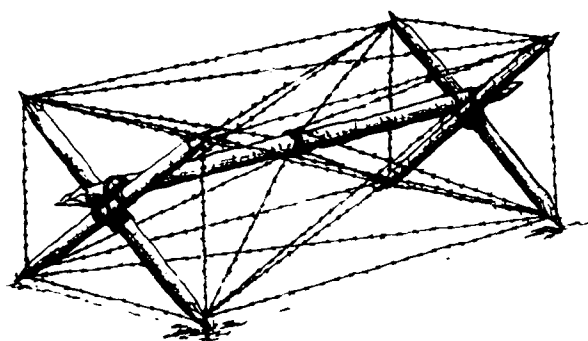


Figure 9-58.—Knife rest.

winch of a truck and use the winch to coil the wire.

Knife Rest

The knife rest (fig. 9-58) is a portable wooden or metal frame strung with barbed wire. Use it wherever a readily removable barrier is needed; for example, at lanes in wire obstacles or at roadblocks. With a metal frame, you can use it

as an effective underwater obstacle in beach defenses. Knife rests are normally constructed with 9.8 to 16.4 feet between crossmembers. They should be approximately 3.3 feet high. The crossmembers must be firmly lashed to the horizontal member with plain wire. When placed in position, knife rests must be securely fixed.

Tripwires

Immediately after a defensive position is occupied and before an attempt is made to erect protective wire, place tripwires just outside of grenade range, usually 98 to 131 feet from the FEBA. These wires should stretch about 9 inches above the ground and be fastened to pickets at not more than 16.4-foot intervals. Conceal them in long grass or crops on a natural line, such as the side of a path or the edge of a field. Place the tripwires in depth in an irregular pattern.

Tanglefoot

Use tanglefoot (fig. 9-59) where concealment is essential and to prevent the enemy from

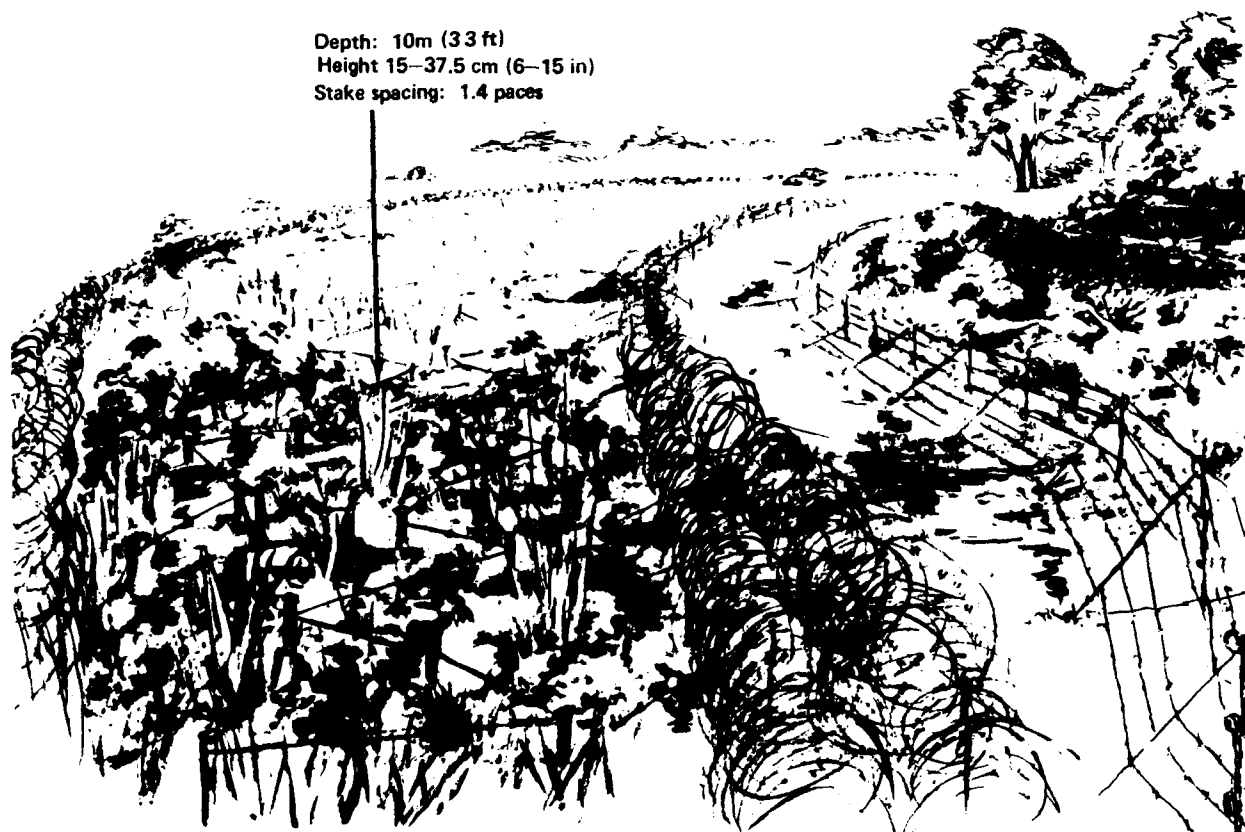


Figure 9-59.—Tanglefoot in barrier system.

crawling between fences and in front of emplacements. Use the obstacle in a minimum depth of 32.8 feet. Space the pickets at irregular intervals of from 2.5 to 10 feet. The height of the barbed wire should vary between 9 and 30 inches. Site tanglefoot in scrub, if possible, using bushes as supports for part of the wire. In open ground, use short pickets. Control the growth of grass to help prevent the enemy from secretly cutting lanes in, or tunneling under, the entanglement.

COMBINATION BANDS

The high wire entanglement may be built with additional rows of fences and triangular cells to

form bands of any desired depth or may be made more effective by adding front and rear aprons. Other types of fences may be combined in bands to form obstacles that are more difficult to breach than a single belt. Portable barbed wire obstacles may be added as described previously. The construction of bands of varied types is desirable because this makes it difficult for the enemy to develop standard methods of passage and it permits fitting the obstacles to the situation and to the time and materials available. Six different types of effective combination bands are shown in figure 9-60. Other variations are readily developed.

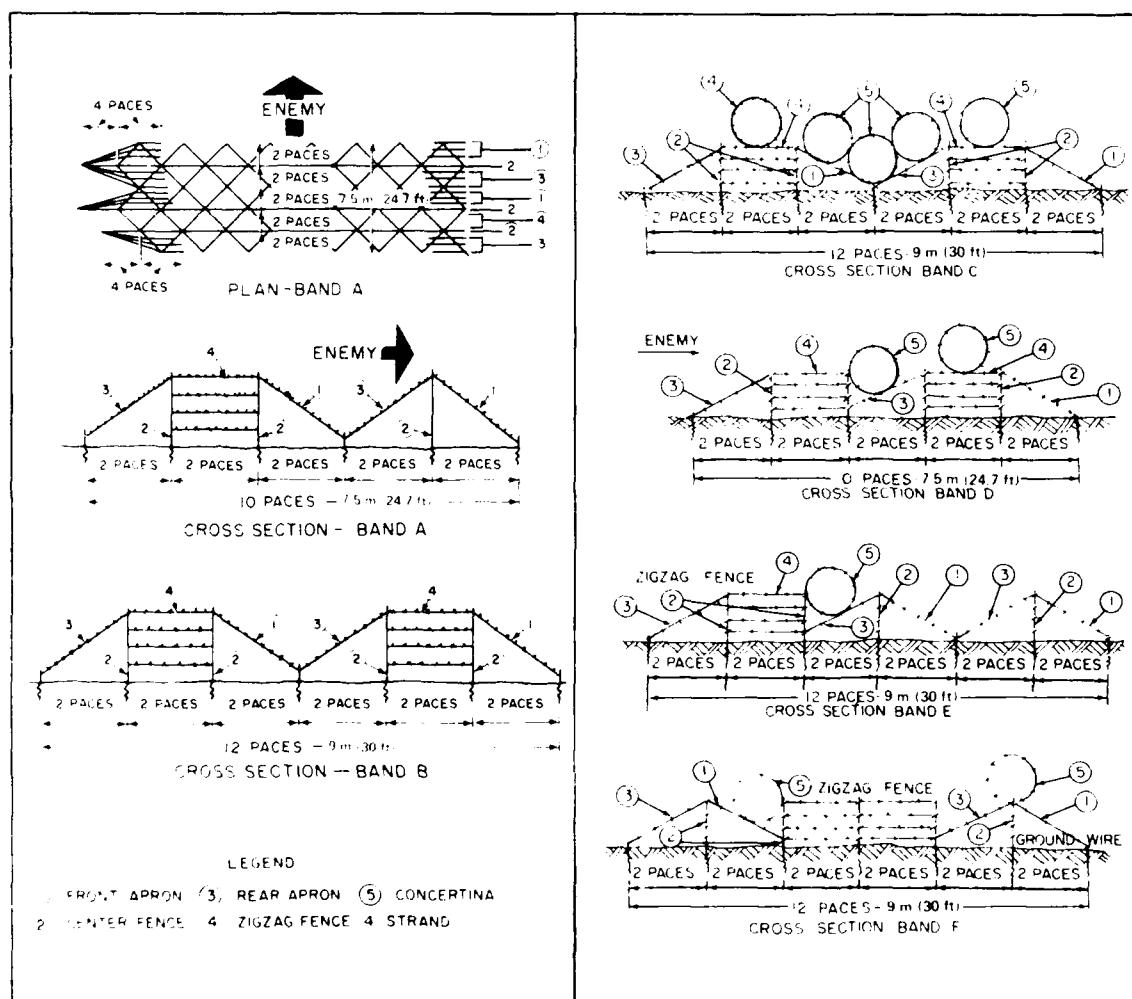


Figure 9-60.—Combination bands of wire obstacles.

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BASIC CONSIDERATIONS

Barbed wire obstacles are constructed primarily from issue materials, thus, both logistical and construction estimates are involved. Table 9-7 gives weights, lengths, and other data required for estimating truck transportation and carrying party requirements. Table 9-8 gives the material and labor requirements for construction of various wire entanglements. Table 9-8 is based on daylight work; for nightwork the man-hours must be increased 50 percent.

REQUIREMENTS FOR A DEFENSIVE POSITION

Table 9-8 gives quantities and weights of material per linear foot of entanglement. If a layout to scale can be developed, the lengths of the various types of entanglements are scaled and the quantities and weights are computed. If a scaled layout cannot be prepared, the rule-of-thumb method may be used for estimating the required lengths of tactical and protective wire

entanglements. If the length of front is taken as the straightline distance between limiting points, the rules are as follows:

1. The length of tactical wire entanglement is 1.25 times the length of front, times the number of belts, regardless of the size of the unit involved.

2. The length of protective wire entanglement for a defensive position is five times the length of the front being defended, times the number of belts. Since protective wire encircles each platoon area of a command, the protective wire entanglement for units is 2.5 times the average platoon frontage, times the number of platoons involved.

3. Supplementary wire in front of the FEBA is used to break up the line of tactical entanglements. Its length is 1.25 times the units frontage, times the number of belts. The length of the supplementary wire entanglement behind the FEBA is approximately equal to 2.5 times the distance from the FEBA to the rearmost reserve unit, times the number of belts. This rule of thumb is adequate for all units.

CHAPTER 10

INDIVIDUAL PROTECTIVE MEASURES

This chapter presents the principles of constructing, camouflaging, and using individual protective measures. Camouflaging is nothing more than hiding or concealing your position or equipment by blending it in with the natural or local surroundings to help avoid detection by the enemy. The intelligent use of the terrain sometimes helps reduce the labor and time required for the construction of emplacements or positions to provide you protection while firing at the enemy. In many cases the natural configuration of the ground provides emplacements which require little, if any, improvements. The following information gives you guidance on the correct application of these protective measures.

COVER AND CONCEALMENT

COVER is protection from the fire of hostile weapons. It may be natural or artificial. Natural cover (ravines, hollows, reverse slopes) and artificial cover (fighting holes, trenches, walls) protect you from flat trajectory fire (projectiles traveling at nearly horizontal angles), and partially protect you from high-angle fire and the effects of nuclear explosions.

CONCEALMENT is protection from hostile ground and/or air observation, but not from hostile fire. It, too, is natural or artificial. Natural concealment is provided by natural objects in their natural locations, such as bushes, grass, and shadows. Artificial concealment is made from materials, such as burlap, nets, or tents, or from natural material.

The best combat position provides, at one and the same time, maximum cover and maximum concealment.

FIGHTING EMPLACEMENTS

A **FIGHTING EMPLACEMENT** is any position you occupy for the purpose of firing. It is a position which provides a good firing position and maximum cover and concealment. A temporary position is converted to a fighting emplacement, or its character, as such, may be improved by digging in, construction, concealment of fresh soil, and improvement.

Digging In

Start digging in when the combat situation requires and/or allows it, and take advantage of all available natural cover. You should have an entrenching tool; however, you can dig with your bayonet or helmet, or both. If necessary, clear the brush to improve your **FIELD OF FIRE** (the direction you will be firing at the enemy).

Since the SEABEES work with ditch diggers, backhoes, and other types of heavy construction equipment, you probably have access to this equipment to help in digging and building your fighting emplacement, depending upon where it is, what the defensive situation is, and how long you are expected to stay in the position.

Construction

Construction includes the improvement of earthworks by placing logs or other objects in defensive positions, such as along parapets (a wall or bank) and overhead. A position should be continually improved as long as it is occupied.

Another area in which a SEABEE might show a difference in the construction of his defensive position would be if a battalion used a

prefabricated fighting hole made from corrugated metal, or a bunker made of block or concrete with a metal plate for a roof. Since SEABEES have access to construction materials, their positions can be made more permanent. SEABEE positions are used as a base camp, or a central position, where they can go to project sites and return when the project has been completed.

Concealment of Fresh Soil

The appearance of fresh soil will betray the location of your emplacement to enemy observers. Therefore, the plan for your dug-in emplacement must include some way to dispose of the soil. Use part of it to make a parapet or ridge around the emplacement. When you start digging in, first slice off the top turf and set it aside. Then as you dig out fresh soil, use it to build a parapet around the position about 6 inches high and about 3 feet wide. Then lay the turf back on this parapet. If more fresh soil must come out, place it in a sandbag or on a canvas and move it well away from the position and dispose of it under low bushes, in a stream, pond, or ravine, or camouflage it in another manner, to the rear of the forward edge of battle area.

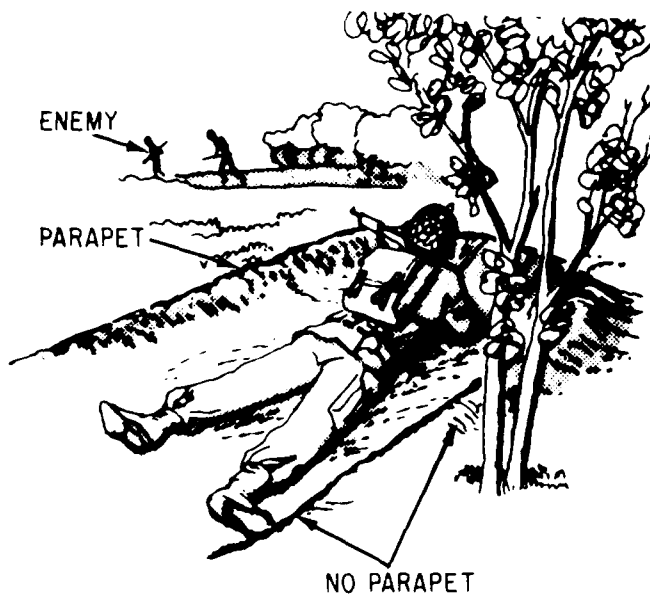


Figure 10-1.—Skirmisher's trench.

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Types of Dug-in Emplacements

The simplest type of dug-in emplacement is the SKIRMISHER'S TRENCH, as shown in figure 10-1. This shallow pit-type emplacement provides a temporary, open, prone firing position for the individual rifleman. When the situation demands immediate shelter from heavy enemy fire and when existing defiladed firing positions (positions which provide protection from fire and/or observation, such as ridges, embankments, and ravines) are not available, each man lies prone or on his side. With his entrenching tool, he scrapes and piles the soil in a low parapet between him and the enemy. Thus, a shallow, body-length pit can be formed quickly in all but the hardest ground. The trench should be oriented with respect to the

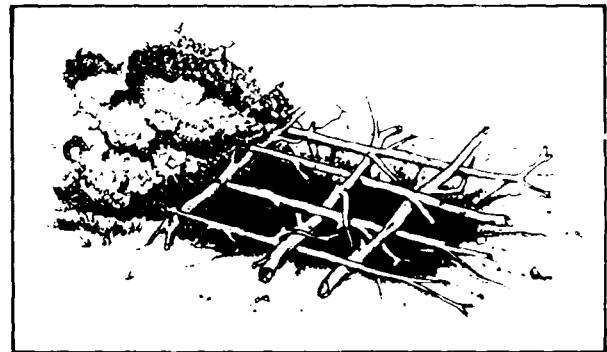
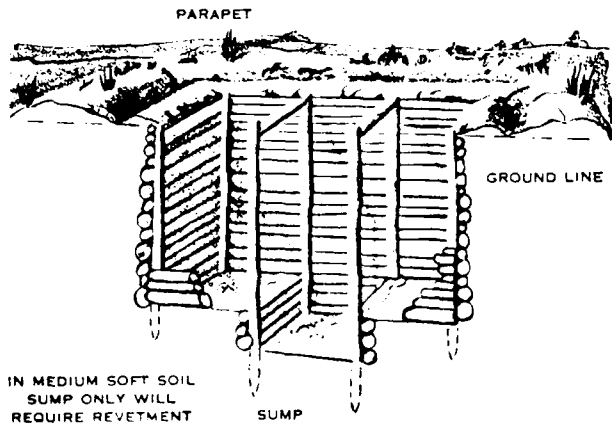


Figure 10-2.—Camouflaged fighting holes.

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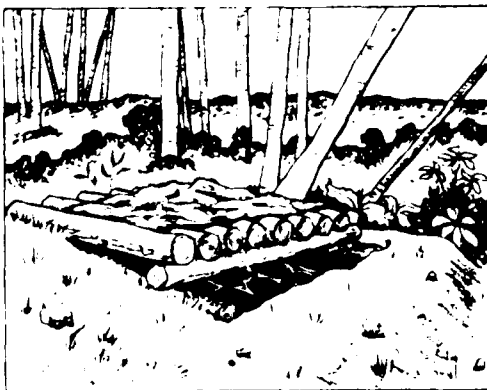


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Figure 10-3.—Cut-timber revetment.

enemy's line of fire so that it is least vulnerable to enfilade fire (fire from the flanking or side position). In a skirmisher's trench, a man presents a low silhouette to the enemy and is afforded some protection from small arms fire.

Figure 10-2 shows CAMOUFLAGED FIGHTING HOLES that may be built either while in contact with the enemy or before contact with the enemy is made. They are a more permanent type of construction than the skirmisher's trench. They may or may not be covered. The two shown are covered, which would help prevent detection, but would not provide much protection from enemy fire. They are constructed to enable a man to fire from a



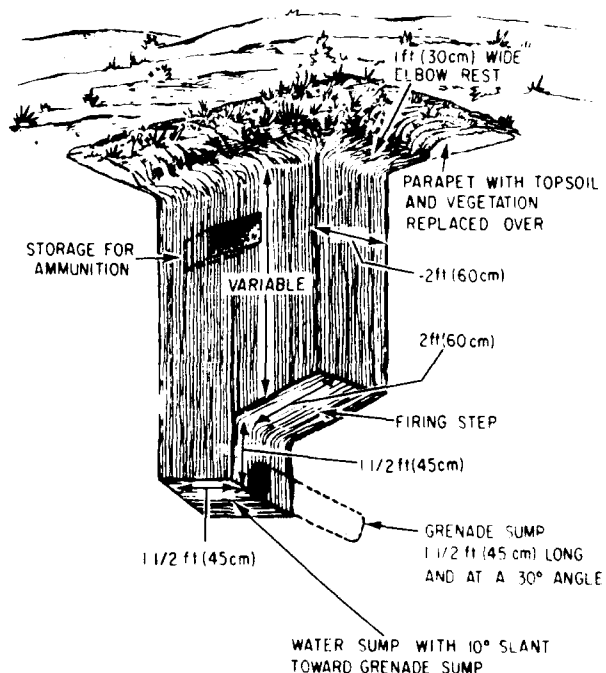
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Figure 10-4.—Fighting hole with overhead cover.

standing position with most of his body protected from enemy fire. These emplacements help provide protection from small arms fire, shell fragments, bombings, and the crushing action of tanks.

Figure 10-3 shows a CUT-TIMBER REVETMENT, constructed when the soil is soft enough to require the timber support shown. Again, this is a more permanent type of emplacement and would normally only be built when a unit expects to stay in an area for quite some time. You would fire from a standing position with most of your body protected from enemy fire. Figure 10-4 shows a fighting hole with an overhead cover providing cover from enemy fire as well as concealment from the enemy.

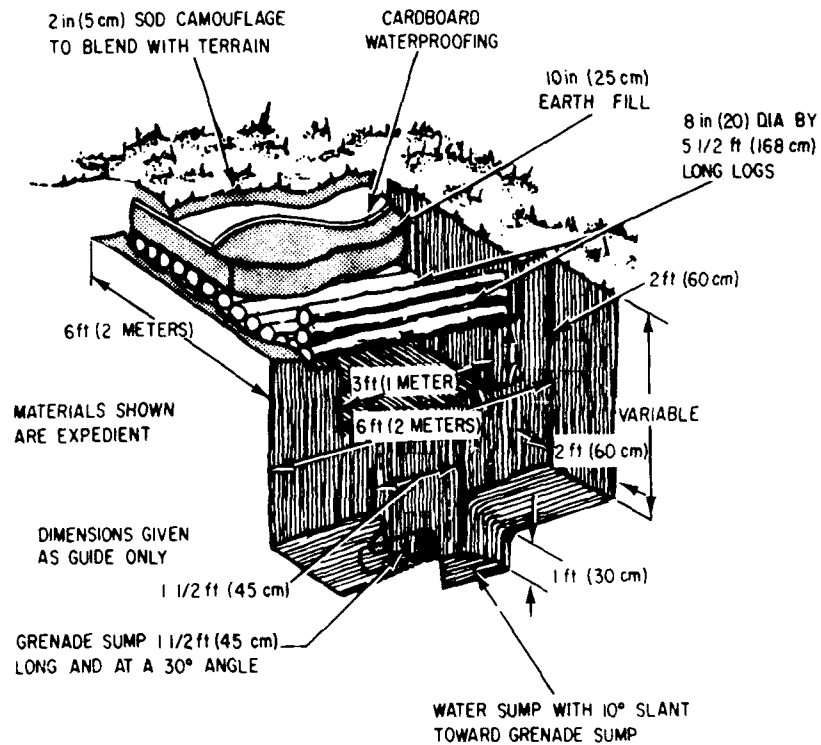
The internal construction of a ONE-MAN FIGHTING HOLE is shown in figure 10-5. It is made as small as possible to present the smallest target to the enemy, but wide enough to accommodate a man's shoulders, and deep enough to use entrenching tools at the bottom. A sump should be built below the firing step, at one end, to catch rainwater. The firing step should be deep enough to protect most of a man's body



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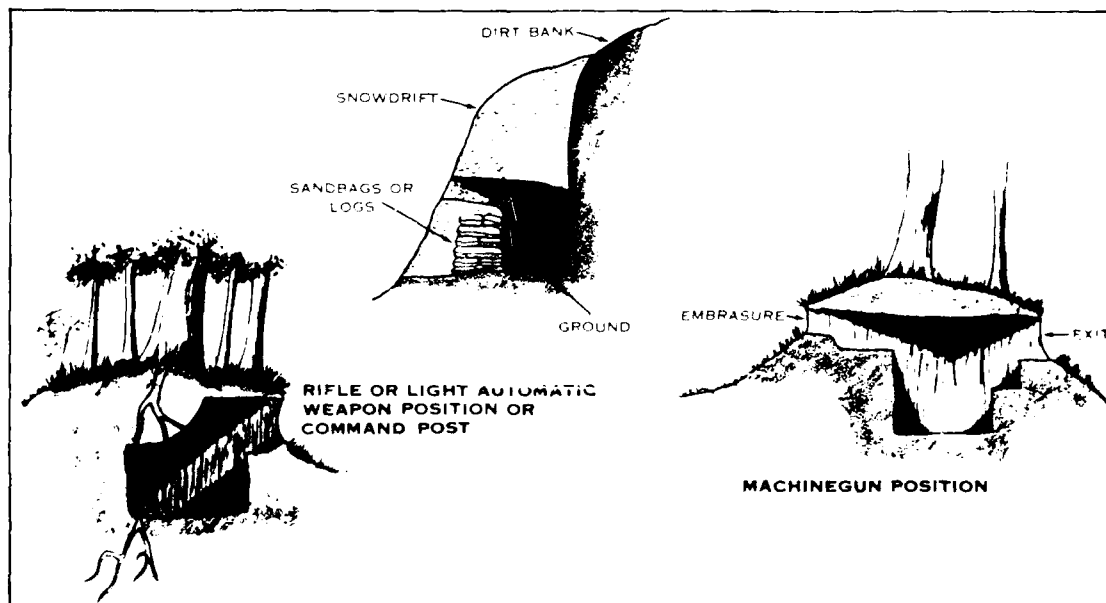
Figure 10-5.—One-man fighting hole.

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Figure 10-6.—Two-man fighting hole.



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Figure 10-7.—Dug-in cave holes.

while firing. A circular grenade sump, large enough to accept the largest known enemy grenade, is sloped downward at an angle of 30° and is excavated under the fire step. Hand grenades thrown into the fighting hole are exploded in this sump, and their fragmentation is restricted to the unoccupied end of the fighting hole. The soil from the hole is used to build a parapet and the edge of the hole for an elbow rest while firing. Be sure to camouflage the soil used for your parapet to help avoid detection of your position.

Figure 10-6 shows a TWO-MAN FIGHTING HOLE which is essentially two one-man holes. The two-man fighting hole provides some advantages over the one-man fighting hole. By being in such close proximity, each man gains a feeling of more security, and it allows one man to rest while the other man is observing the area. One disadvantage is since it is longer than a one-man hole, it provides less protection from tanks, bombing, strafing, and shelling.

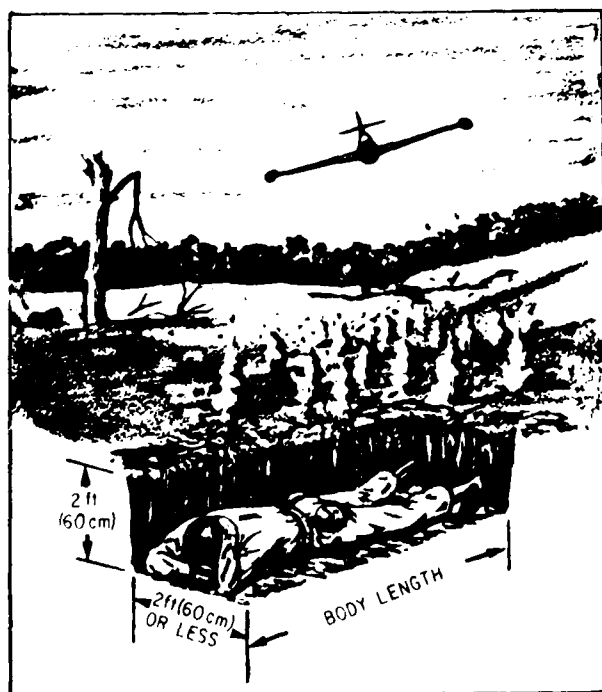
The types of dug-in CAVE HOLES, shown in figure 10-7, are dug in the side of hills or mountains and are used as a unit's command post,

a machine gun position, or a rifle or light automatic weapon position. When possible, the entrance to these emplacements should be concealed and camouflaged. They provide excellent protection from enemy observation and fire.

A PRONE EMPLACEMENT (fig. 10-8) provides protection from small arms fire, shelling, bombing, and strafing by enemy planes. It is a one-man hole and is normally the type of emplacement dug by and for command post personnel.

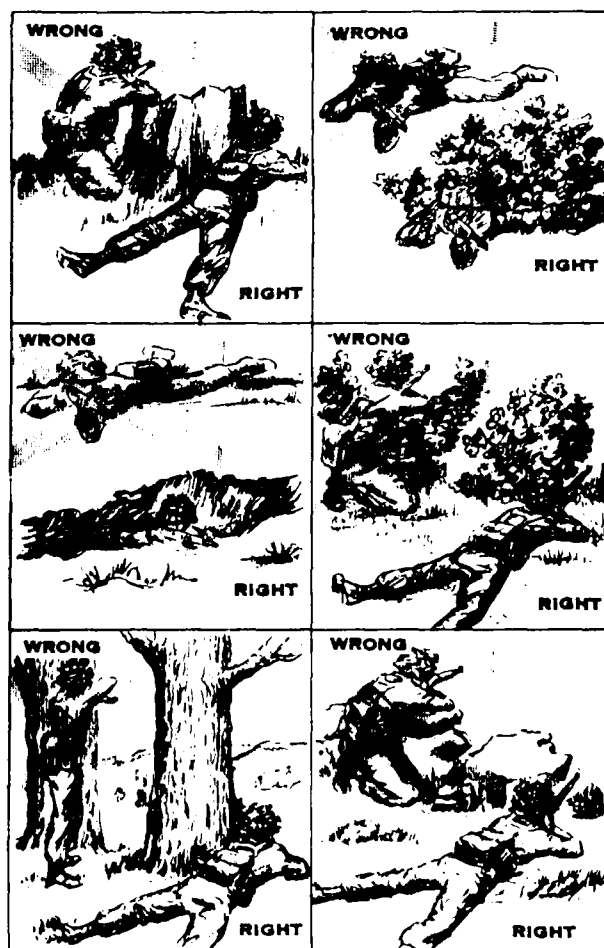
Temporary Battlefield Positions

Figure 10-9 illustrates the application of cover and concealment principles in the selection of a



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Figure 10-8.—Prone emplacement.



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Figure 10-9.—Correct and incorrect battlefield positions.

temporary battlefield position. The illustrations indicate you should observe and fire around the side of an object, and keep as low as possible to cover and conceal most of your head and body. The illustrations show a rifleman who is right-handed firing or observing; a rifleman who fires left-handed would observe and fire from the left side of the object he is using for cover and concealment.

CONCEALMENT

The **FIRST** principle of concealment is to **AVOID ALL UNNECESSARY MOVEMENT**. You may frequently be in a position where you will escape observation if you remain still, but will instantly attract observation if you move. Any movement against a stationary background causes you to stand out very clearly; therefore, if you change position, move carefully (over a concealed route if possible) to the new position.

The **SECOND** principle is to **USE ALL AVAILABLE CONCEALMENT**. Background is important; blend in with it to prevent detection. Trees, bushes, grass, earth, and artificial structures form backgrounds of various colors, and the color is a factor in whether or not you will be concealed by blending. Select a background which blends with your uniform and absorbs the outline of your figure. Stay in the shadows whenever possible.

The **THIRD** principle of concealment is **KEEP LOW**—that is, maintain a crouch or squat, or better still, a prone position. The lower silhouette you present, the more difficult it will be for the enemy to see you. Keep off the skyline, even at night.

Finally, **EXPOSE NOTHING THAT SHINES**. Sunlight reflecting off a shiny surface can be seen for a great distance and instantly attracts attention.

CAMOUFLAGE

Camouflage is a general term applied to measures (either natural or artificial) taken to conceal yourself, your position, and your equipment from enemy observation. Three general rules for camouflage are as follows:

1. Take advantage of all available natural concealment.

2. Camouflage by altering the form, shadow, texture, and color of objects.

3. Camouflage against both ground and air observation.

Camouflaging a Position

To avoid detection by the enemy, use the following methods of camouflaging a position.

1. Before constructing your position, study the terrain and vegetation in the area so that after your position is completed, by the use of camouflage, you will be able to restore the area as near as possible to its original appearance.

2. Do not use more material than you need. Too much camouflage can reveal a position as quickly as too little camouflage.

3. Obtain natural material from a wide area. If you strip a small adjacent area of foliage, the stripped area will give the position away.

4. Always conceal excavated soil by covering it with leaves or grass, or by dumping it under bushes, into streams or into ravines.

5. After camouflaging, inspect the position carefully from the enemy's viewpoint. Check it repeatedly to ensure that it remains natural in appearance and continues to conceal the position.

6. Practice **CAMOUFLAGE DISCIPLINE**. Avoid doing anything, such as scattering cans or boxes around the camouflaged position, that will give the position away. When possible, use old, established paths to and from your position. Do not create new paths which could be seen from the air. If necessary, vary the route to and from the position so there is no beaten path into the position.

Camouflaging Personal Equipment

The color of field uniforms and web equipment—pack, belt, and canteen cover—blends well with most terrain unless the equipment is badly faded. If it is faded, color it to blend with the surrounding terrain. If no paint is available, use mud, charcoal, or crushed grass. Color in bold, irregular patterns.

Alter the distinctive outline of your helmet with a cover of cloth or burlap that is colored to blend with the terrain. Let foliage stick over the edges, but do not use too much of it. Use a

camouflage band, string, burlap strips, or rubber bands to hold the foliage in place.

Use mud or dirt to dull any shiny surfaces of weapons—being careful not to foul any working parts.

Camouflaging the Person

Exposed skin—even dark skin—reflects light. To prevent this, camouflage face paint sticks are issued and used in a two-color combination. Although these sticks are called face paint sticks, they are used on any exposed skin and are issued and used in the following combinations:

1. Loam and light green, for light-skinned personnel in other than snow regions.
2. Sand and light green, for dark-skinned personnel in other than snow regions.
3. Loam and white, for all personnel in snow regions.

Apply face paint sticks or other materials as follows:

1. Paint the shiny areas (forehead, cheeks, nose, chin, exposed skin on the back of your neck, and your hands and wrists) with the darker color. Paint the shadow areas (around the eyes and under the nose and chin) with the lighter color.
2. When applying face paint, use the buddy system with one man working on and checking another.
3. If face paint is not available, burnt cork, charcoal, or lampblack may be used. Mud should be used only when nothing else is available since it changes color as it dries, and when dry, may flake off and leave exposed skin. Also, mud may contain harmful bacteria and should be used only on approval of a medical officer.

Camouflaging Vehicles

A badly concealed vehicle can lead to much more than just a lost vehicle; it may mean discovery of your unit or complete destruction of an installation. As is always the case in camouflage, the aim should be to occupy a position without altering its appearance. To do this, vehicles should be parked under natural cover whenever available. When cover is inadequate,

vehicles should be parked so that the shape of the vehicle will disappear into the surroundings. Better concealment can be obtained by using natural rather than artificial material to break up the shape and shadow of the vehicles. This type of material is always available near a parking site or motor pool and can be erected and removed quickly. When cut foliage is used, be sure it is put up as it was growing because the underside of leaves is much lighter than the topside, and the difference in color could give your position away. In addition, cut foliage should be replaced as soon as it starts to wither.

The principal artificial materials used to conceal vehicles are drape nets. They are easy to use, quickly erected, and quickly removed. Drape nets give complete concealment against direct observation, but, as with most artificial camouflage materials, can frequently be detected by photographic observation because they often fail to blend properly with the background. In any case, drapes do conceal the identity of a vehicle, even though the drape net itself may be detected.

Camouflaging of Buildings

The basic methods of concealment—blending, hiding, and deceiving—can be applied either to existing buildings or new construction. However, concealment is much easier when the camouflage scheme is incorporated in the designs for new construction and site selection.

Buildings can be concealed by screens of garnished nettings. Another method is to have disruptive patterns painted over the netting, roof, and gable-end walls. Where concealment from close observation is required, the netting should be sloped gradually to the ground. For structures with roofs steeper than 30°, the netting must cover the whole building.

If the terrain permits, a new structure can be partially dug in, in order to reduce the height and in turn, its shadows. The nature and size of buildings can be disguised in many ways, such as:

1. Placing trees between the buildings.
2. Painting the roofs to match the surrounding terrain.
3. Varying roof lines with wooden framework, then covering with burlap or fine mesh wire netting to simulate sloping hip roofs.

4. Erecting superstructures over existing buildings and covering them with burlap, plastic, or other material to alter their appearance so they resemble the surrounding native buildings.

Camouflaging Supply Points

From a camouflage viewpoint, the large concentration of materials is the main problem. Huge amounts of equipment and supplies of all kinds are usually brought up at the same time. They must be unloaded and concealed quickly, and yet be easily accessible for redistribution. Therefore, natural cover and concealment must be used at supply points whenever possible. Dispersal of these supplies is a must to minimize damage from a single attack. Existing overhead cover should be used when new access roads are planned. If the supply point is to be permanent, then the tracks running in and out of the installation can be concealed by overhead nets slung between trees. Traffic control should include measures to conceal activity and movement at, to, and from the installation. When natural cover is sparse or nonexistent, be sure the natural terrain features are used to advantage.

Maintain camouflage discipline at supply points including a minimum of changes in the appearance of the terrain. Control the debris so that it does not accumulate and attract enemy attention.

Camouflaging of Water Points

Water points must have adequate concealment, either artificial or natural, for operating personnel, storage tanks, pumping, and purification equipment. When the surrounding terrain foliage is not thick enough for perfect concealment, it can be supplemented by natural or artificial camouflage materials.

To keep the enemy from observing the shine of water in the tanks, place canvas covers or natural foliage over them. By using foliage or artificial materials, you can distort their features.

Small open areas that must be crossed by vehicles or personnel operating in the area can be concealed with natural or artificial materials.

A water supply schedule must be instituted and maintained. Without camouflage discipline or with a violation of the schedule, a concentration of waiting vehicles which cannot be readily concealed could occur.

CHAPTER 11

COMBAT MANEUVERS AND FORMATIONS

In this chapter we want to acquaint you with the method of moving through enemy controlled terrain either on your own or in small groups. Usually in such instances, it is imperative that your movement not be seen or heard. If this cannot be avoided, you must at least be able to move quickly with minimum exposure. Movement, rushing, hitting the deck, crawling, moving silently, and taking action under flares will be discussed.

In addition, we give information on combat formations designed to mold individuals into effective fighting teams that can move toward and assault an enemy for the completion of an assigned mission.

MOVEMENT

When you move about, it is best to travel a short distance quickly; then stop, listen, observe, and move on again. Before moving from the concealment or cover of one position, always pick out your next position. In addition, look for an alternate new position in case you are unable to reach your first choice. Observe the area carefully for enemy activity, then select the best available routes to the new locations. Take advantage of darkness, fog, smoke, or haze to assist in concealing your movement.

Change direction from time to time when moving through tall grass. If you move in a straight line the grass will wave with an unnatural motion that might attract attention.

The best time to move is when the wind is blowing the grass.

When stopping between movements, observe briefly if birds or animals were alarmed. Their flight or movement may attract the enemy's attention, or they may give you a clue to the enemy's location.

Take advantage of any distraction caused by noises, such as bombing, shelling, rifle fire, or vehicle movement.

Go across roads, trails, and rivers where there is the most cover and concealment. Search for a large culvert, a low spot, or a curve; but keep in mind that these are the most likely spots for enemy mines and booby traps.

Avoid steep slopes and areas with loose stones or gravel. Also, avoid ridges or cleared areas where you would make a good silhouette.

RUSHING

The rush is the fastest way to move from one position to another, and it should always be used when the enemy is almost certain of observing you because you are not concealed. Generally, you start the rush from the prone position (fig. 11-1, view 1). Slowly move your head to select the new position to which you will move (fig. 11-1, view 2). Avoid raising your head too high, and always look around the side of an object rather than over

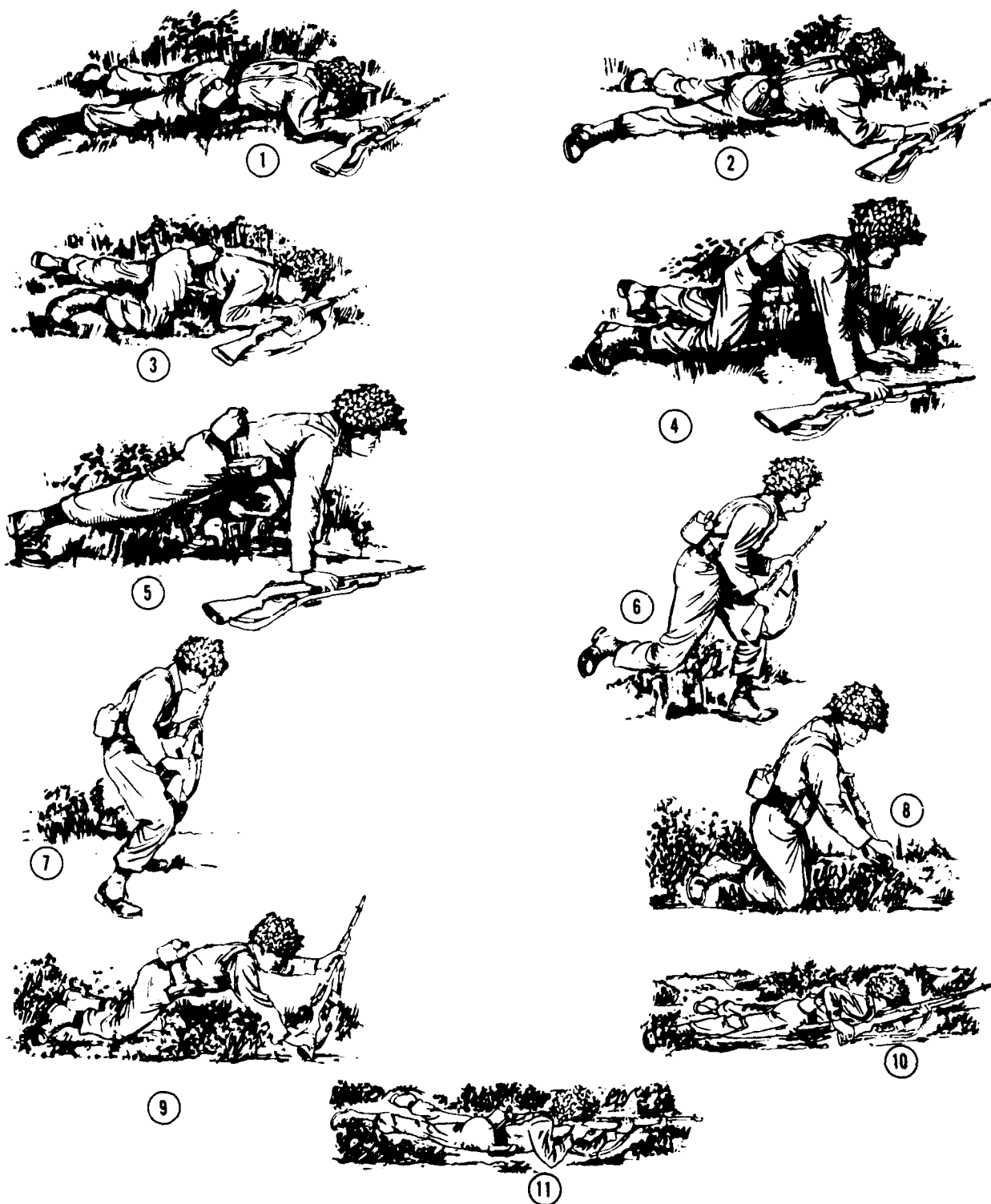


Figure 11-1.—Rushing and hitting the deck/dirt.

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the top to prevent making a sharp silhouette. Slowly lower your head; then draw your arms in close to your body, keeping your elbows down, and pull your right leg forward (fig. 11-1, view 3). With one movement, raise your body by straightening the arms (fig. 11-1, view 4). Quickly spring to your feet, step off with the left foot (fig. 11-1, view 5), and then run to the new location by the quickest and shortest route, keeping low and using all available cover (fig. 11-1, view 6).

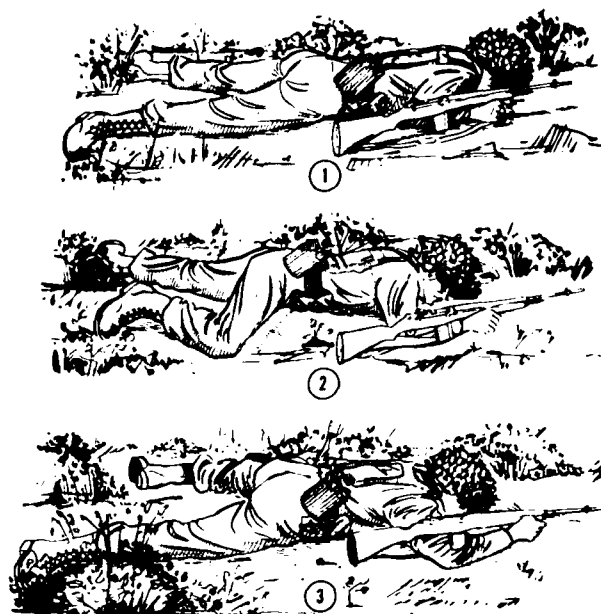
HITTING THE DECK

After reaching your new position at the end of the rush, you must quickly get into the prone position again. Going into the prone position from rushing is known as hitting the deck or dirt. To do this, firmly plant your feet about 18 inches apart, and while sliding your hand to the heel of the rifle butt (fig. 11-1, view 7), drop to your knees (fig. 11-1, view 8). Fall forward, breaking your fall with the butt of your rifle unless you are armed with the M16 (fig. 11-1, view 9); then, after shifting your weight to your left side, bring your rifle forward (fig. 11-1, view 10). Place the butt of the rifle in the hollow of your shoulder; then roll into a firing position (fig. 11-1, view 11). If your weapon has a plastic or fiberglass stock, such as the M16, it is better if you don't use it to break your fall. Instead, grasp your rifle in one hand and break your fall with the other.

Lie as flat as possible. If you think you were observed, move to the right or left, preferably where there is cover and concealment.

CRAWLING

There are times when you must move with your body close to the ground to avoid enemy fire or observation. There are two ways of doing this, the LOW CRAWL and the HIGH CRAWL. It



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Figure 11-2.—The low crawl.

will be up to you to decide which method is best suited to the conditions of visibility, cover and concealment, and the speed required.

Use the LOW CRAWL when cover and concealment are scarce, when visibility permits good enemy observation, and when speed is not essential. Keep your body as flat as possible against the ground. Grasp your rifle sling near the upper sling swivel. Allow the balance to rest on your forearm, and let the butt drag along the ground. Keep the muzzle and operating rod clear of the ground (fig. 11-2, view 1).

To start forward, push your arms ahead and pull your right leg forward (fig. 11-2, view 2). Move by pulling with your free arm and pushing with your right leg. Every so often, change your pushing leg to avoid getting tired (fig. 11-2, view 3).

Use the HIGH CRAWL when cover and concealment are available, when poor visibility reduces enemy observation, and when more speed is needed.



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Figure 11-3.—The high crawl.

Keep your body free of the ground and rest your weight on the forearms and lower legs. Cradle the rifle in your arms, keeping the muzzle off the ground. Keep your knees well behind your buttocks so that your rump remains low. Move forward by alternately advancing your right elbow and left knee; then your left elbow and right knee (fig. 11-3).

The low crawl and high crawl are not suitable for moving silently. To crawl silently, you must move on your hands and knees (fig. 11-4). Start by laying your weapon carefully on the ground to your side. With your right hand, feel or make a clear spot for your knee. While keeping your hand on the spot, bring your right knee forward until it meets your hand. Next, clear a spot with your left hand and move your left knee up in the same manner. Be sure your weapon is always in reach! To move your weapon, feel for a place, clear it, and lift the weapon into position. Crawl very slowly and keep your movements absolutely silent.

MOVING SILENTLY

The movements just explained, rushing and crawling, are not particularly useful when you are very close to the enemy because they often create a shuffling noise. When extremely quiet movement is necessary, especially when you are on patrol or stalking an enemy, you must use the movements described below. These movements are particularly useful when you are moving at night. The movements must be made slowly; they are very tiring and require extreme patience and self-control to be performed properly.



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Figure 11-4.—Crawling silently.

WALKING SILENTLY

While walking, hold your weapon at port arms. Make your footing sure and solid by keeping your weight on one foot as you step with the other. When stepping, raise your foot high to clear brush and grass. With your weight on the rear leg, gently let your foot down toe first (fig. 11-5). Feel softly with your toe to pick a good solid spot, and then lower your foot. Shift your weight and balance to your foot that is forward and then continue. Take short steps to avoid losing your balance. At night and when moving through dense vegetation, avoid making unnecessary noise by holding your weapon with one hand and extending the other hand forward so you can feel for any obstructions as you move.



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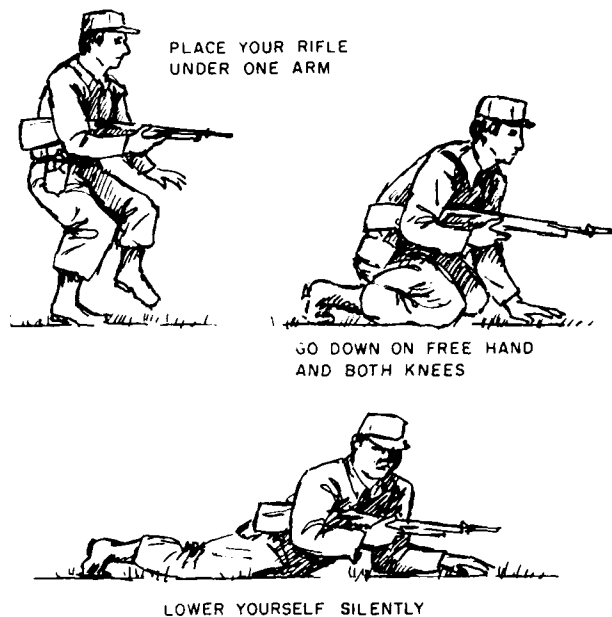
Figure 11-5.—Walking gently with your toe down first.

ASSUMING THE PRONE POSITION SILENTLY

To assume the prone position silently (fig. 11-6), hold your weapon under one arm and crouch slowly. Feel for the ground with one hand, making sure it is clear by removing small twigs and other objects that make noise. Lower your knees one at a time until your weight is on both of your knees and your free hand. Shift your weight to your free hand and opposite knee. Raise your free leg up and back slowly; then lower it to the ground gently, feeling with your toe for a clear spot. Roll gently to that side and move your other leg into position in the same way. Roll quietly into the prone position.

ACTION UNDER FLARES

If you are caught in the open by an overhead flare, you should immediately hit the deck. Since the burst of light is temporarily blinding to the enemy also, there is a chance that you may not have been seen. If you hear the flare being fired, try to get down before it bursts. Resume movement as soon as the flare burns out.



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Figure 11-6.—Assuming the prone position silently.

If you are caught in the light of a ground flare, move out of the area of light as quickly and quietly as possible. Keep moving until you are well away from the area, then reorient yourself and continue on.

If you are caught by a flare when crossing an obstacle, such as barbed wire, crouch low and remain motionless until the flare burns out.

When you are assaulting a position and a flare bursts, continuing your assault is imperative.

COMBAT FORMATIONS

Combat formations are designed to group individuals into effective fighting teams that can move to and assault an enemy position with minimum confusion. The use of combat formations, with the related arm and hand signals (as shown in chapter 8), enables the squad leader or

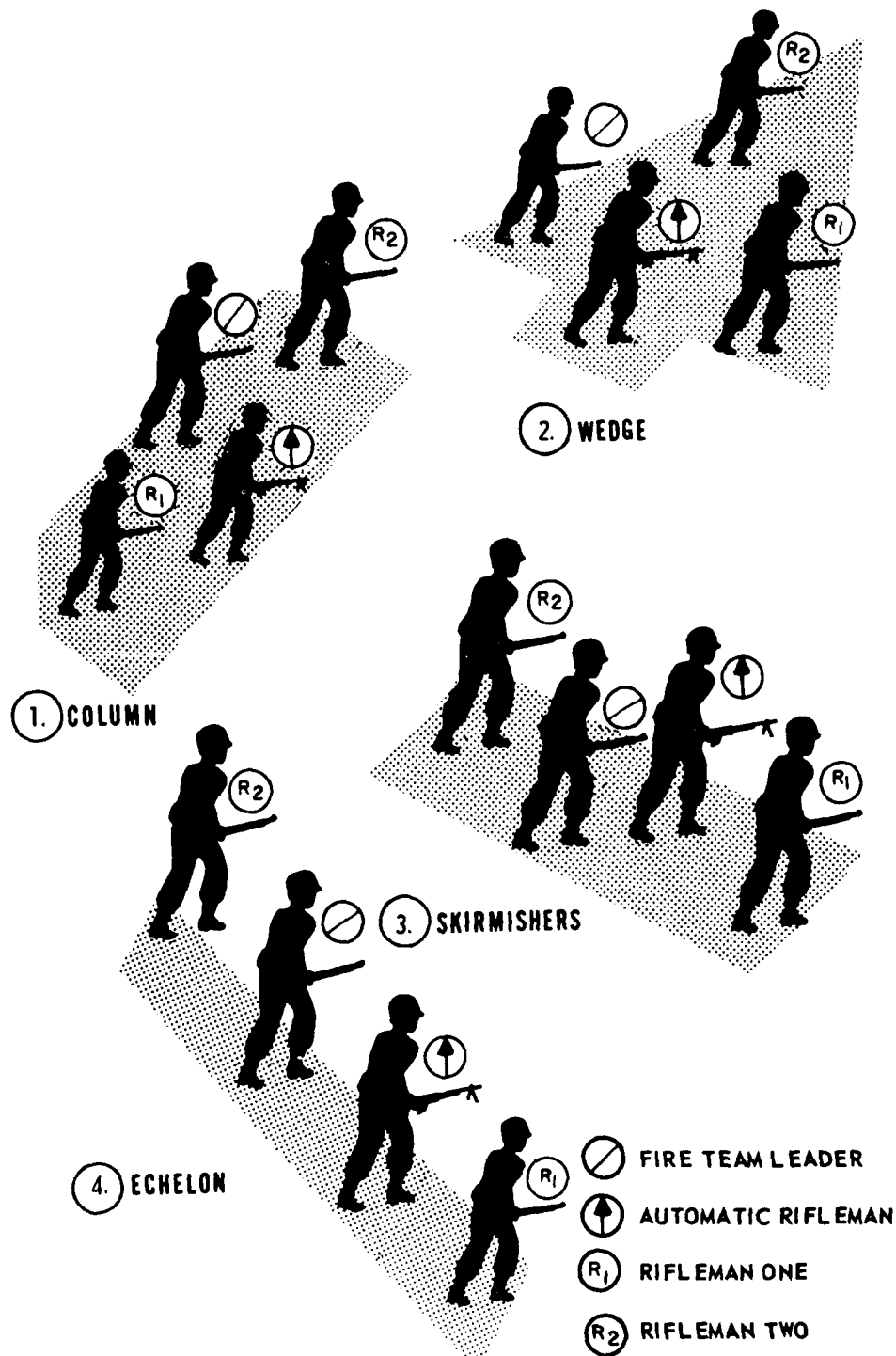


Figure 11-7.—Basic formations, fire team.

other leaders to control the fire and maneuver his unit just as the quarterback of a football team uses plays and signals. Anyone who can't remember the plays or signals on the ball field will probably endanger the team's chances of winning the game. On the battlefield, the stakes will be much higher. The success of your mission as well as your survival will depend on teamwork.

When the situation, terrain, or enemy activity does not permit close formations, the unit leader will deploy his men in an extended formation. Deployment is executed on signals or commands. The leader may deploy his units in a variety of formations at any one time, depending on the situation. Relative positions within these formations are flexible, and the leader should take advantage of the cover and concealment offered by the terrain. However, he must take care not to mask the fire of another unit. Maintaining exact distances between individuals and units is not necessary as long as control is not lost. However, under ideal conditions, the recommended space between individuals is 5 yards. All leaders and units must maintain sight and voice contact with each other. All changes in formation are by the shortest practical route. Leaders must take full advantage of cover and concealment and avoid backward or lateral movement.

FIRE TEAM MOVEMENTS

The FIRE TEAM LEADER controls the use of the formations. He places himself where he can best observe and control the fire team and, in addition, receives orders from his squad leader. He must also be in a position where he can quickly and effectively control the employment of the automatic rifle.

The AUTOMATIC RIFLEMAN is an interior man. He should position himself between the fire team leader and Rifleman No. 1. Here he can quickly deliver fire to either flank, as directed by the fire team leader, and receive the help and protection of the adjacent rifleman.

RIFLEMAN NO. 1 assists the automatic rifleman by supplying him with loaded magazines and by keeping the automatic rifle in action. He coordinates both his position and movement with those of the automatic rifleman.

RIFLEMAN NO. 2 is at the place in the fire team formation that enemy action or probable enemy action threatens most. He acts as a security

element; for example, if the team is moving toward the enemy, he would be in the foremost position.

The basic fire team formations are COLUMN, WEDGE, SKIRMISHERS RIGHT/LEFT, and ECHELON RIGHT/LEFT.

Fire Team Column

The fire team column formation (fig. 11-7, view 1) is used when speed and control are governing factors, such as through woods, fog, smoke, and along roads and trails. This formation is favorable for fire and maneuvers to either flank but is vulnerable to fire from the front because its own fire in that direction is limited.

Fire Team Wedge

The fire team wedge formation (fig. 11-7, view 2) is used when the enemy situation is unknown but contact is possible. When the terrain and visibility require dispersion of the men, the wedge formation provides all-around protection and flexibility and is easy to control.

Fire Team Skirmishers Right/Left

Skirmishers right/left (fig. 11-7, view 3) can be used most effectively when you are assaulting a known enemy position. It is also useful for "mopping up" operations (searching for enemy stragglers), and crossing short, open areas. Because the fire team is in a line, skirmishers right/left provides maximum firepower to the front. However, the formation is difficult to control.

Fire Team Echelon Right/Left

Fire team echelon right/left (fig. 11-7, view 4) is used primarily to protect an exposed flank. This formation permits heavy firepower to both the front and the direction of echelon. As with skirmishers, the formation is difficult to control; therefore, movement is generally slow, especially during conditions of reduced visibility.

Changing Fire Team Formations

Dependent upon the changing terrain features or the tactical situation, the fire team leader will change formations to meet these new conditions. Figures 11-8 through 11-15 illustrate the manner

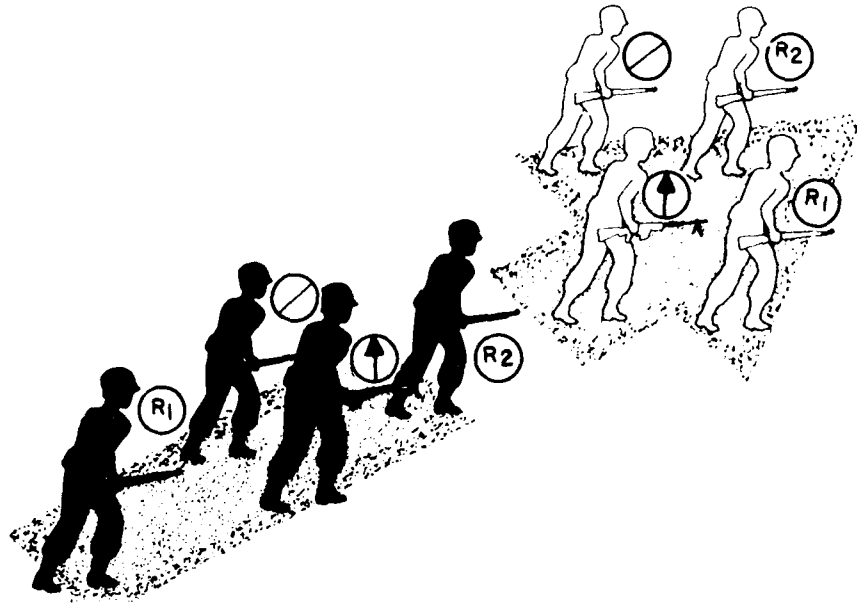


Figure 11-8.—Column to wedge.

2.267

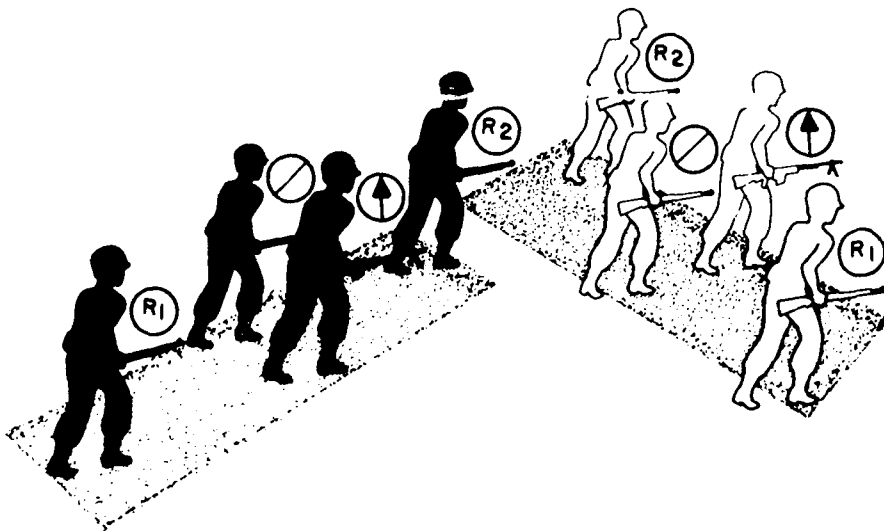


Figure 11-9.—Column to skirmishers right.

2.268

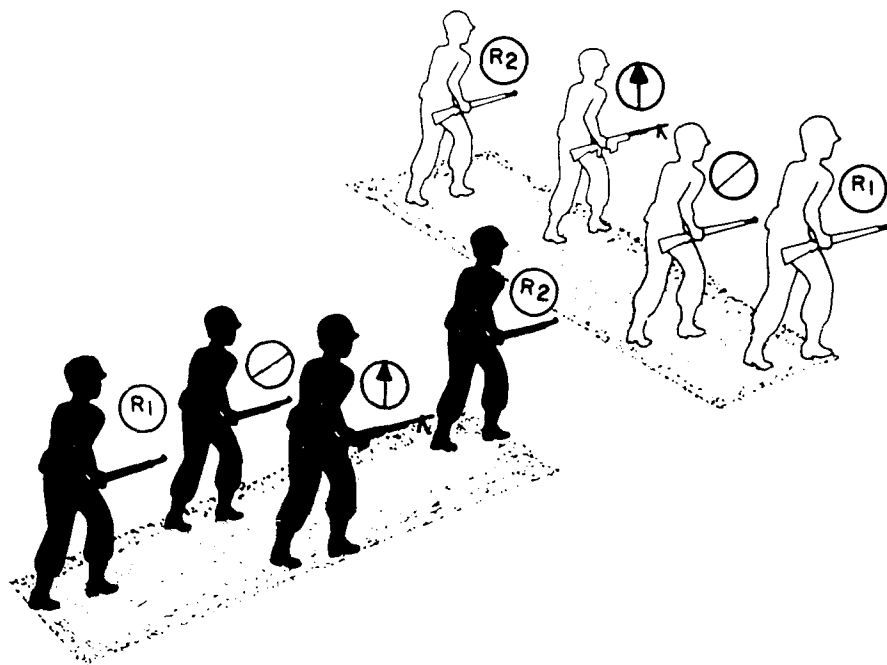


Figure 11-10.—Column to skirmishers left.

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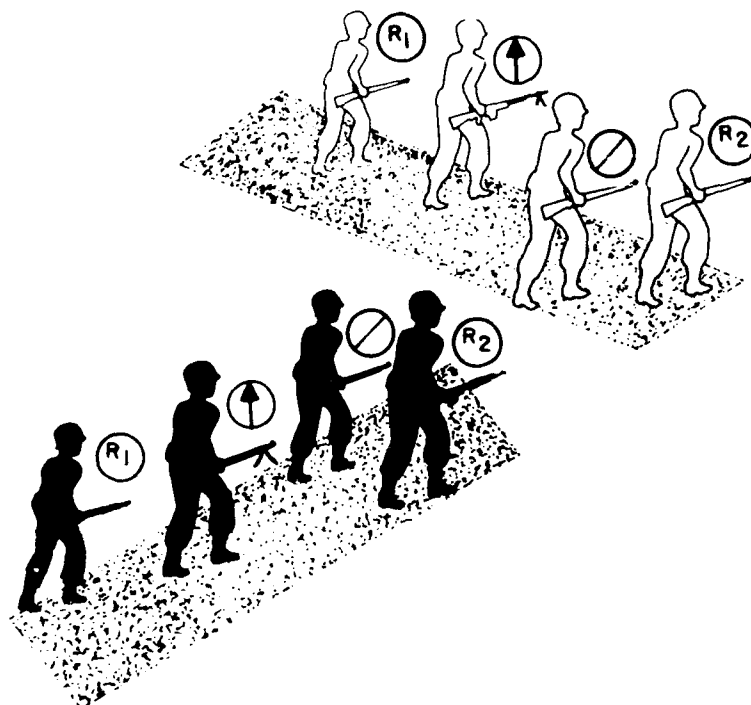


Figure 11-11.—Column to echelon left.

2.270

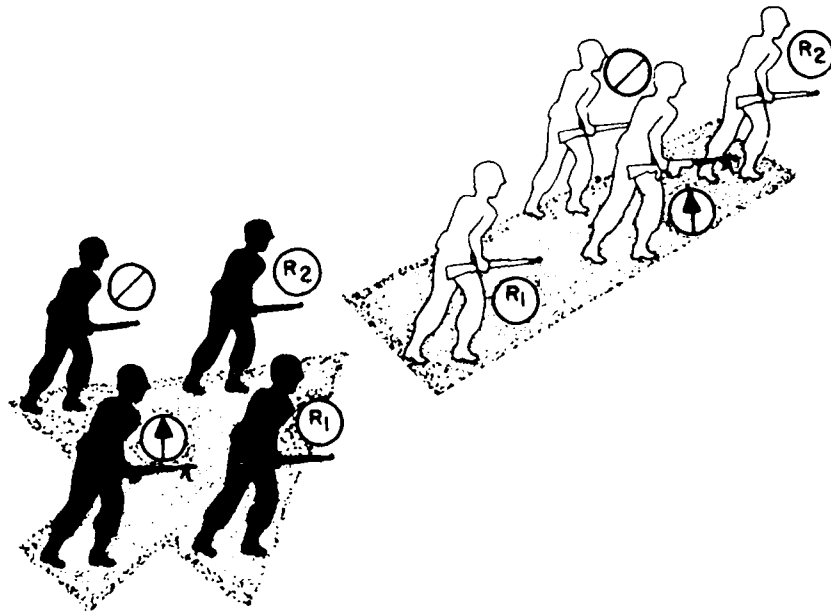


Figure 11-12.—Wedge to column.

2.271

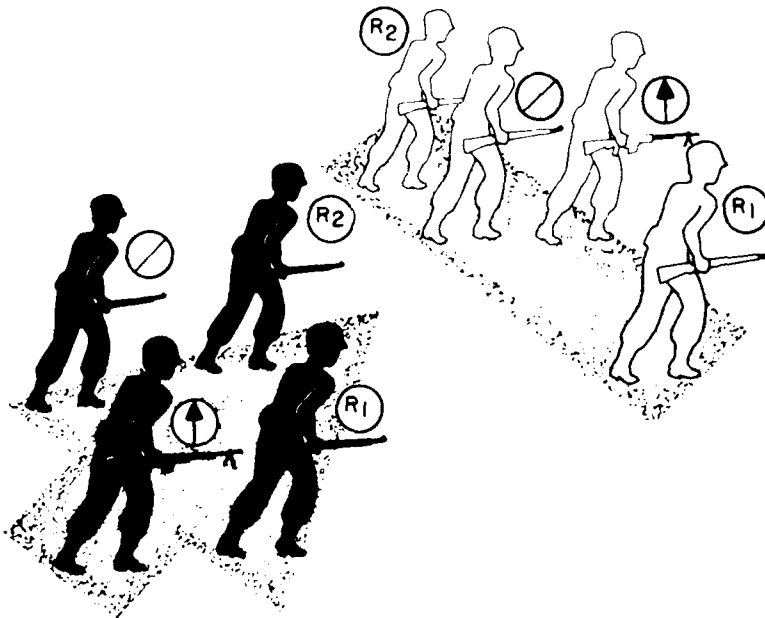


Figure 11-13.—Wedge to skirmishers right.

2.272

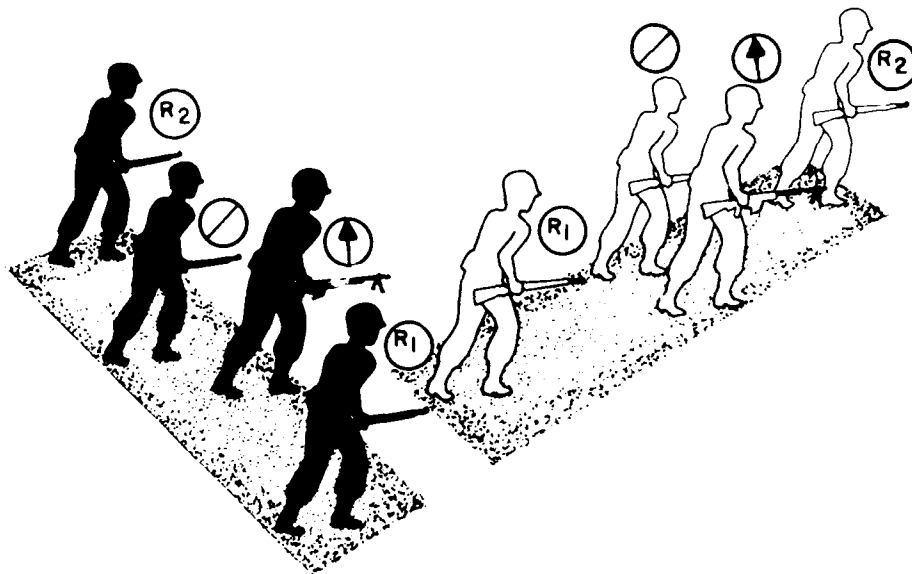


Figure 11-14.—Skirmishers right to column.

2.273

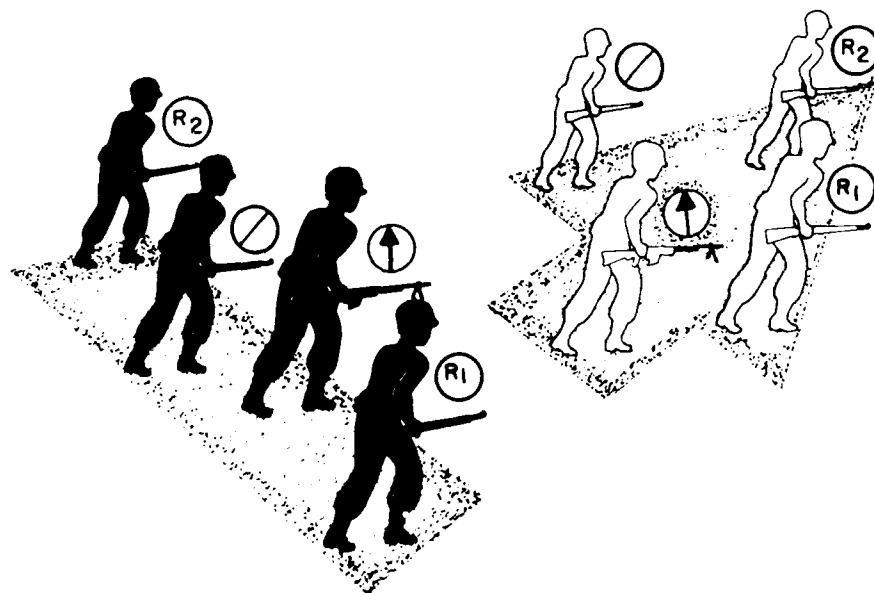


Figure 11-15.—Skirmishers right to wedge.

2.274

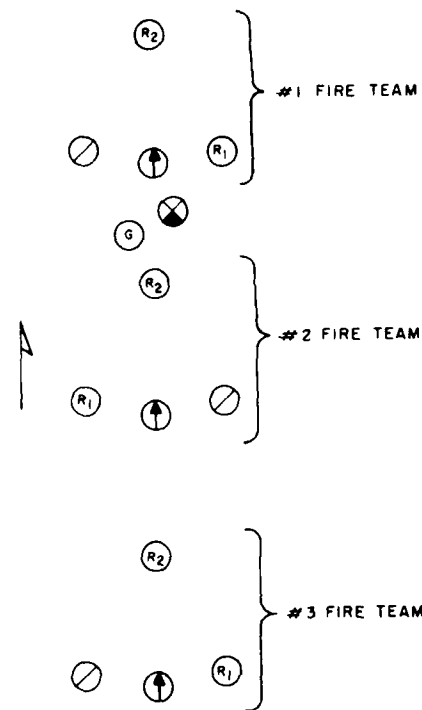
in which each individual moves when changing from one formation to another.

RIFLE SQUAD FORMATIONS

The squad formations are similar to those of the fire team. However, an additional formation known as the SQUAD VEE is used by the squad, and skirmishers right/left is called SQUAD LINE.

The SQUAD LEADER designates the type of formation to be used, and he places himself where he can readily observe his fire teams and the enemy. Normally, the fire team formation within the squad formation is left to the discretion of the fire team leader. For example, the squad may be in SQUAD VEE, but the fire team(s) may be in the fire team wedge (fig. 11-16). The exact formation is flexible at any level and is influenced by the terrain and the circumstances.

The grenadier always remains close to the squad leader regardless of the formation. Observe



2.276

Figure 11-17.—Squad column, fire teams in wedge.

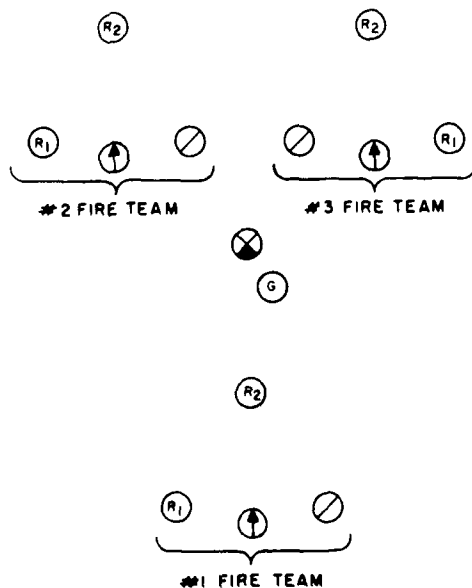
the following figures. His exact location in any formation depends upon the orders of his squad leader.

Squad Column

In SQUAD COLUMN (fig. 11-17), the fire teams are arranged in succession one behind another. This formation is vulnerable to fire from the front, but controlling and maneuvering are easy. It is especially suitable for narrow, covered routes of advance; for maneuvering through gaps between areas receiving hostile artillery fire; for maneuvering through woods; and for moving in fog, smoke, or darkness.

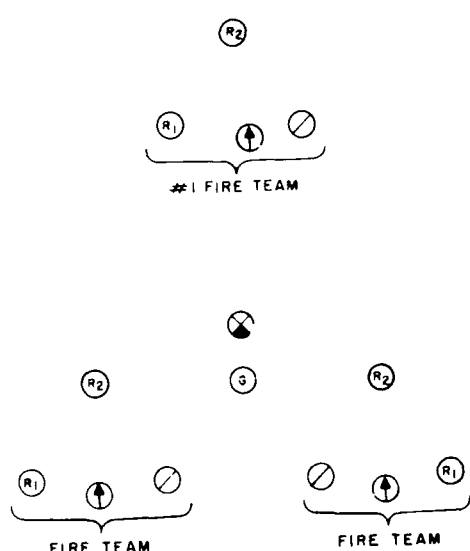
Squad Wedge and Squad Vee

The squad wedge (fig. 11-18) and squad vee (fig. 11-16) formations provide good security to



2.278

Figure 11-16.—Squad vee, fire teams in wedge.



2.277

Figure 11-18.—Squad wedge, fire teams in wedge.

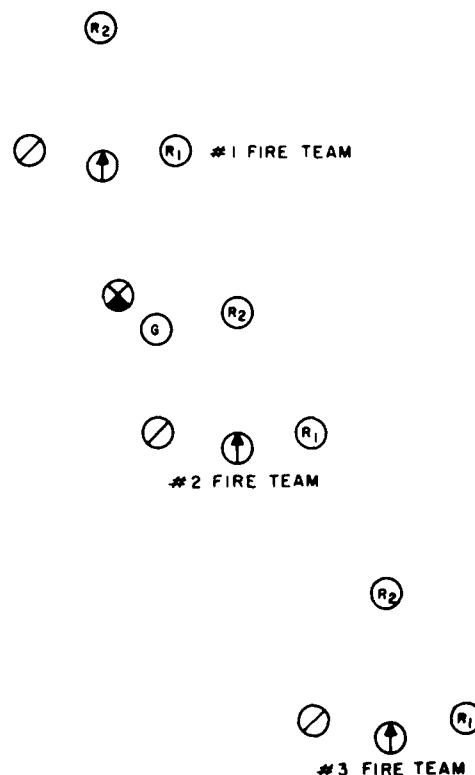
both the front and the flanks. These formations are relatively easy to maneuver and control and can be quickly adapted to meet new tactical situations. The nature of terrain generally determines which of the two formations is to be employed, the amount of frontage to cover, and the proximity and actions of the enemy.

Squad Echelon Right/Left

In squad echelon right/left, the fire teams are placed diagonally one behind the other (fig. 11-19). This formation is used to protect an exposed flank, particularly when the enemy is known to be on that flank. From this formation, maximum firepower can be promptly delivered to the right/left flank or toward the right/left front.

Squad Line

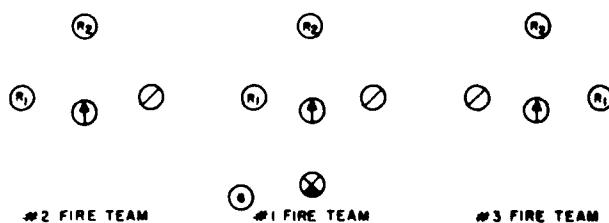
The squad line, as the name implies, places all three fire teams abreast of one another on a line (fig. 11-20). It permits maximum firepower



2.229.1

Figure 11-19.—Squad echelon right/left, fire teams in wedge.

to the front in the shortest time, so it is used extensively during an assault on a known enemy position. The squad line is suitable for rapidly crossing an unavoidable open area covered by enemy machine guns or artillery.



2.230.1

Figure 11-20.—Squad line, fire teams in wedge.

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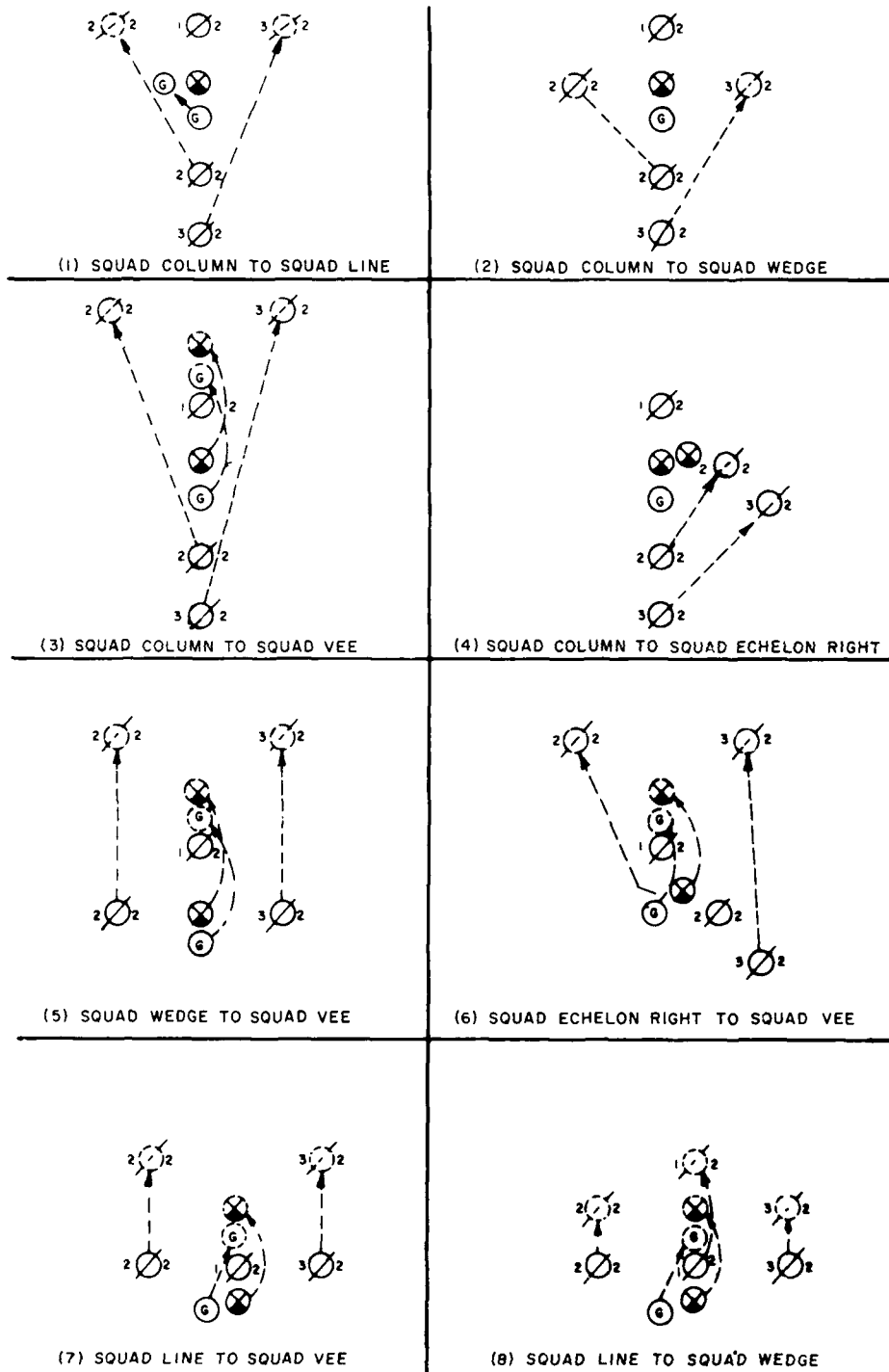


Figure 11-21.—Changing squad formations.

187.40

Changing Squad Formations

Squad leaders change squad formations in the same way and for the same reasons as the fire team leaders change the fire team formations. Figure 11-21 illustrates the majority of these changes. Notice that the first fire team is used as a pivot for all formations and that the other fire teams take the most direct route to their new location. Although any formation shown can also be used to show the opposite movement, remember that all movement is to the front. For example, figure 11-21, view 1, shows a squad column moving to the squad line. To move from the squad line back into the squad column, fire teams two and three would not move to the rear and fall in behind team one. Instead, fire team one would move forward rapidly. Then teams two and three would move at a forward angle in behind it.

RIFLE PLATOON FORMATIONS

The platoon commander selects the initial attack formation for his platoon. However, he may change this formation as the attack progresses to meet a changing tactical situation. The available avenues of approach toward the enemy affect the platoon commander's choice to a great degree. Also, the need for security, control, flexibility, and speed influences his choice. On occasion, the platoon commander may prescribe the initial formation of the fire teams within the squads.

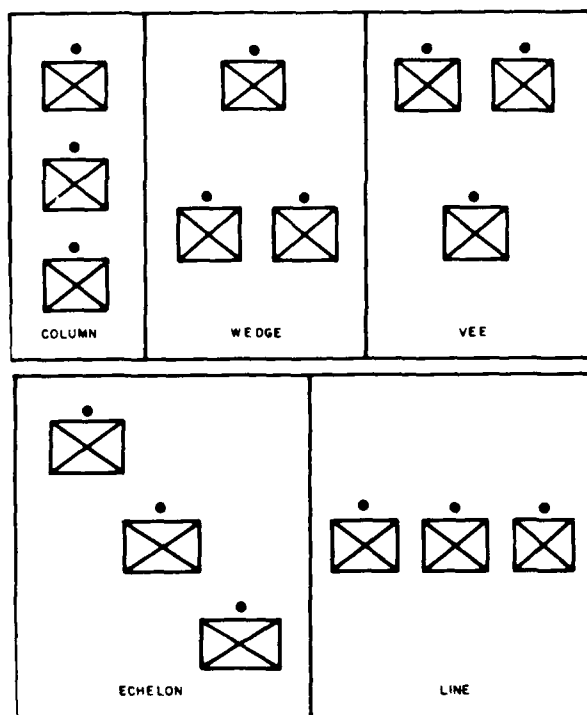
Platoon formations (fig. 11-22) are similar to squad formations and are described below.

Platoon Column

The platoon column makes control easier and action to the flanks favorable. It employs minimum firepower forward and is useful when speed and control are governing factors and when visibility is limited. It is suitable for advancing through narrow, covered avenues of approach with maximum speed and control.

Platoon Wedge

The platoon wedge makes control easier, provides good all-around security, and is



3.25:26

Figure 11-22.—Rifle platoon formations.

extremely flexible. It permits reasonable firepower to both the front and flanks. When the enemy is known to be in the area but his exact strength and location are unknown or not clear, the platoon wedge is used. Also, it is useful when the terrain and visibility require a greater dispersion of the platoon. The wedge tends to keep the bulk of the platoon from becoming engaged with the enemy too soon. It also permits flexibility in the employment of the squads when contact is established.

Platoon Vee

The platoon vee uses movement into the platoon line formation (see fig. 11-22). It provides excellent firepower to both the front and flanks and is useful primarily when the enemy's strength and location to the front are known. The platoon vee is easy to control and provides good security but is less maneuverable than the wedge.

Platoon Echelon Right/Left

The platoon echelon formations are hard to control; therefore, movements are slow and maneuvering difficult. However, it does provide heavy firepower to the front and in the direction of echelon. The platoon echelon is used primarily in protecting an exposed flank, either right or left.

Platoon Line

The platoon line formation allows the platoon to deliver maximum firepower to the front. It is very difficult to control and is most often used in the coordinated assault of all three squads.

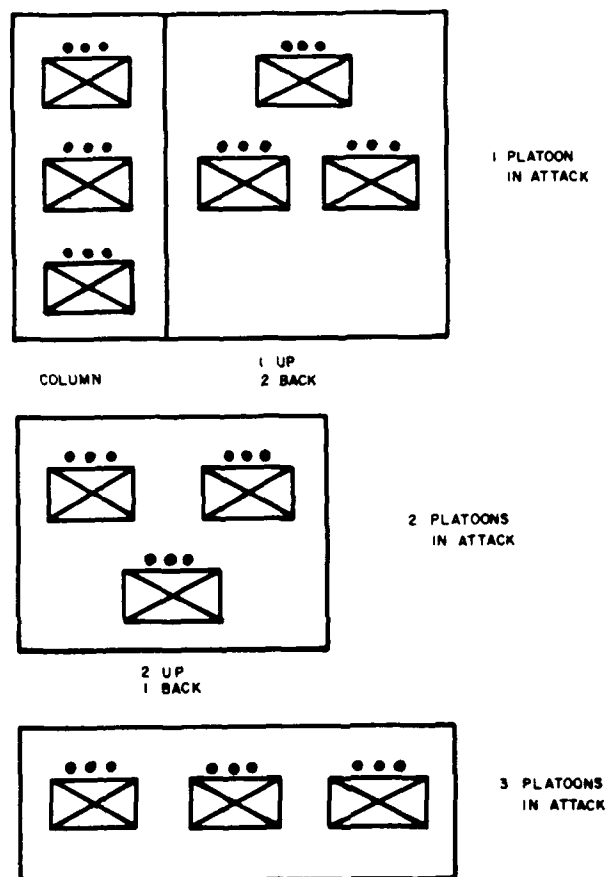
Changing the Platoon Formation

Generally, the relative positions of the squads within the platoon remain fairly constant. However, since combat is unpredictable, often changes are necessary. As usual, these must be made as rapidly and smoothly as possible.

Platoon formation changes are identical to those of the squads as shown in figure 11-21. The platoon commander, with his staff, will naturally try to stay in a central location where he can best observe the situation and can control the attack.

RIFLE COMPANY ATTACK FORMATIONS

The rifle company commander distributes his company into three elements: a main attacking force, a supporting attack force, and a reserve force. Attacking forces, fire support forces, and the reserves are all specifically designated in an **ATTACK ORDER** issued by the senior commander. Usually, the supporting attack is an attack by fire, whereas one or more rifle platoons maneuvering to seize the assigned objective(s) compose the main attack force. The supporting attack force may contain units from the weapons platoon. In fact, the two major construction/rifle companies (Charlie and Delta) of a construction battalion each have their own weapons platoon. The reserve force is kept to the rear of the attacking forces where it can readily move to the attack if the need arises. There are no fixed conditions that determine the most appropriate formation for a given situation. The



187.41

Figure 11-23.—Rifle company attack formations.

company commander must weigh all circumstances of terrain, the enemy's strength and location, and the friendly fire support available to decide on one of the following attack formations (fig. 11-23).

One Platoon in Attack

A formation of one platoon in attack and two platoons in reserve provides limited firepower to the front and a strong reserve. This formation would be used when information about the enemy is vague or when the company attacking has one or both flanks exposed. This formation may be used when only a single, narrow avenue of approach is available or when you are attacking to seize an objective deep in enemy territory. The

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reserve platoons may follow the attacking platoon in company column, or they may be positioned to protect one or both flanks. This formation provides a lot of variety in positioning and movement of the reserve platoons and gives the company commander maximum flexibility in maneuver and control.

Two Platoons in Attack

Two platoons in attack and one platoon in reserve provide moderate firepower to the front while retaining a reserve large enough to influence action. This formation may be appropriate when relatively detailed information concerning the enemy is available.

Three Platoons in Attack

When the three-platoon attack with no reserve is employed, the company lacks a reserve to use in influencing the action. This formation provides maximum firepower to the front and may be useful when a wide area must be cleared rapidly or when the enemy situation is known.

WEAPONS UNITS FORMATIONS

Weapons platoons give the maneuvering rifle units machine gun, rocket, and mortar fire during the attack. This is normally done by deploying the weapons units in strategic locations so they can deliver a large volume of fire against the enemy position. This fire, known as the **BASE OF FIRE**, is intended to keep the enemy pinned down while the rifle units maneuver against them.

After a decision is made that a weapons unit will accompany a rifle unit in the assault, that unit (team, squad, or platoon) will be directly under the command of the senior rifle unit leader. For example, one machine gun squad consisting of two machine gun teams might be attached to a single rifle platoon. Then the machine gun squad leader would be directly under the control of the rifle platoon commander. During any advance or movement, the machine gun section leader would position himself within easy signaling distance of the rifle platoon commander. The positions of the two machine gun teams are well within the advancing unit in sight of their squad leader. Preferably, they would also be in a position to be able to move quickly to either flank. The rifle unit leader must provide the weapons units with security in all directions. If possible, there should always be at least one fire team between a weapons unit and the enemy at all times.

There are no combat formations specifically designed for the weapons units. However, the units should assume a formation similar to that used by the unit to which they are attached. So if the rifle unit leader forms his men into a line to cross an open area, the weapons unit leader should do the same with his men.

Once a position is reached where the weapons can effectively provide a base of fire, the rifle unit leader will order the weapons unit leader to set up his weapons. Targets will be designated by the rifle unit leader. Once the enemy is engaged, the rifle units will maneuver to overrun and destroy them. The weapons units will continue to deliver fire until the enemy is destroyed or they are endangering their own troops.

CHAPTER 12

PATROLS AND AMBUSH

A patrol is a detachment of troops sent out from a larger body on a mission of combat, reconnaissance, security, or contact with friendly units. There are two general classes of patrols—reconnaissance and combat—either of which might have a mission of security. The classification is derived from the mission assigned a patrol. In the SEABEES you will be primarily concerned with defensive combat; therefore, in training your men in patrolling, the emphasis should be on security patrolling rather than aggressive patrolling.

In security patrolling, both reconnaissance (recon) and combat patrols are used. The typical SEABEE defense will be a static defense; therefore, the recon patrol is mainly used to detect enemy movement toward your position. The combat patrol is used to destroy enemy recon patrols and to delay and confuse an enemy attack.

This chapter provides information on the patrols and ambushes used during defensive combat. In addition, this chapter covers the types of ambushes that may be met while you are on a recon patrol as well as the procedures most commonly used in ambush countermeasures.

RECONNAISSANCE PATROLS

Reconnaissance patrols are sent out to gain information about the enemy or the terrain. These patrols engage in combat only when it becomes necessary to accomplish their mission or to protect themselves. In general, they should avoid combat and accomplish their mission by stealth.

Reconnaissance patrols have a variety of missions, but their primary mission is to obtain and report information in time for it to be valuable to the commander who desires it.

A reconnaissance patrol might be dispatched to do the following:

1. Locate and observe the characteristics of a hostile position or installation.
2. Reconnoiter a possible route of march for an enemy force.
3. Reconnoiter a certain terrain feature or the general nature of the terrain in a given locality.
4. Patrol the perimeter of the defense area in a static defense. Of primary importance is any indication of a troop buildup or movement and the type of armament the enemy has.

These missions mentioned above are by no means all-inclusive but are given merely as examples.

PRIMARY AND SECONDARY MISSIONS

A patrol should never be given more than a single PRIMARY mission. But an ALTERNATE mission may be assigned that will be carried out if achieving the primary mission is impossible. In addition, SECONDARY missions may be assigned if they are consistent with carrying out the primary or alternate mission.

SIZE OF PATROLS

A patrol may consist of two men, a fire team, or a larger tactical unit. The size of a combat or reconnaissance patrol depends on several influencing factors that must be considered before the patrol is dispatched. Sometimes, a small patrol may be able to execute the mission. At other times, a strong combat patrol may be needed. In general, a patrol should be made up of the least

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number of men needed to carry out a given mission, with careful thought given to safety, available time, and messenger requirements.

The size of a patrol depends upon the following influencing factors.

1. Mission
2. Terrain and visibility
3. Distance from friendly troops
4. Time the patrol will be out
5. Number of messages it may have to send back
6. Whether prisoners are to be captured and sent back

Patrols with missions requiring combat or a strong likelihood of combat are usually stronger than patrols on reconnaissance missions. Also, if a patrol intends to be gone for some time and is going to operate at considerable distance from friendly troops, it must be stronger because there is greater danger from attacks.

A reconnaissance patrol rarely exceeds a squad in size. Units larger than a squad are too noisy, more difficult to control, move more slowly, and have greater difficulty approaching the enemy without detection. The fire team is ideal for short-range reconnaissance patrols.

A patrol leader is given a **PATROL ORDER** containing all the instructions, information, and guidance needed to plan, prepare for, and accomplish the mission. Patrol orders were discussed in chapter 8.

Details in a patrol order will vary with circumstances, but the following are usually included: time of departure, time of return, checkpoints, general route, and communications plan.

The **TIME OF DEPARTURE** may be in general terms, such as, "Leave after dark" or "Leave before daylight." However, a patrol order may give a specific time of departure to avoid congestion of an area, to reduce the possibility of collision between patrols, to maintain strict control by the command, or for some other reason.

The **TIME OF RETURN** may be either general or specific. Information obtained by a reconnaissance patrol may lose its value if it is not received by a certain time. Future combat operations may hinge on a report from a combat patrol given at a specific time.

CHECKPOINTS are points along the patrol route from which the patrol is expected to report in—usually by radio.

The **GENERAL ROUTE** is usually designated by the checkpoints. An exact route is seldom feasible except in reconnaissance. If the command desires to maintain strict control of the patrol, the order may specify an exact route.

The **COMMUNICATIONS PLAN** means the reports the patrol must make and the medium (usually radio) by which they are to be sent.

PATROL FORMATIONS

Any particular patrol formation should provide for all-around security and good control. The formation should help ensure that only a minimum number of men within the patrol will be pinned down at one time by surprise fire.

Patrol formations must be fluid and flexible. They must be changed to meet varying terrain and visibility conditions. The patrol leader designates the original formation. Individual members then maintain assigned positions as long as they can see each other and, at the same time, make full use of cover and concealment.

Patrols use the basic combat formations. For small patrols in open terrain, the wedge is a suitable formation. For larger patrols or when visibility becomes restricted, the column, with its necessary security elements, is used.

When enemy contact is near or has already been made, patrol leaders should adopt more deployed formations.

Normally, the following factors will influence and change a patrol formation:

- Mission
- Terrain
- Visibility
- Enemy situation
- Size of patrol
- Required speed of movement

Chapter 12—PATROLS AND AMBUSH

The formations taken by a patrol will ALWAYS be influenced by the need for maintaining

1. security and control,
2. the mission, and
3. the route of the patrol.

CONTROL

The patrol leader places himself where he can best maintain control. Normally, this is at, or near, the head of a patrol but will depend somewhat upon the patrol route. If the route is clearly defined, the leader should take a position within the patrol wherever his signals can best be seen by patrol members. If the route is ill-defined as in dense woods, jungle, or at night, the leader must be in, or with, the leading group.

The second in command, the assistant patrol leader, assists the patrol leader in controlling the patrol. He helps the patrol leader by controlling the rear of the patrol and by preventing men from falling behind or getting out of position. He is continually alert for signals or orders and watches to see the other members receive those orders or signals. He observes the rear to prevent the patrol from attack from that direction. He is ready to take command of the patrol if the leader becomes a casualty.

Patrols are controlled in the daytime by arm-and-hand signals and oral orders. Each member of a patrol must be thoroughly familiar with the standard arm-and-hand signals. These signals were discussed in chapter 8. Before contact with the enemy has been made, the patrol leader will need to issue his orders. Oral orders are a sure means of control. Commands should be just loud enough to be heard by patrol members. When near the enemy, the patrol should be halted for issuing orders. The leader moves from man to man and quietly gives the instructions. Sound signals may be used if they will not be confused with other noises. If a sound signal is used, the patrol leader should rehearse it before beginning the patrol. Control by voice is usually better than control by other sound signals.

Though darkness helps a patrol move close to the enemy without being detected, it increases the problem of control. To overcome this, each man is required to keep in sight of the man to his front

and flank. This keeps everyone in position to receive signals and orders.

SECURITY

All-around security must be maintained at all times. This is done within a patrol by using formations that give protection to the front, flanks, and rear. These elements are the eyes, ears, and fingers of the patrol leader. They move following his signals. They maintain contact with him at all times except when a bush or small terrain feature briefly gets in the way. To maintain contact with the patrol leader, security elements must glance in his direction every few steps.

Point and Scouts

Small patrols may use only one man or as many as a fire team as the point. The size depends on the enemy situation, terrain, and patrol route. Normally, a squad-size patrol uses two riflemen as scouts. However, should the patrol come to a dangerous area or close to the enemy, the leader might increase the number in the point. The leader may use an entire fire team to cover the advance of the patrol.

Then, the automatic rifleman moves slightly behind the rest of the fire team. From this position, he can cover the movements of the scouting element. The size of the point increases in relation to the size of the patrol.

The point is responsible for investigating the route of advance immediately to the front of the patrol. When visibility is good, it may precede the main body by as much as 100 yards. The point must always maintain visual contact with the patrol leader.

Flanks

One man on each side may provide flank security for a patrol the size of a squad, or less. The flanks move as directed by the patrol leader. In special instances, two-man groups may be necessary. Such a group keeps one man where he can see the patrol leader at all times. He remains within 100 yards of the leader. The man farther out remains in sight of the inside man, normally within 20 to 25 yards.

In open terrain, the flankers should investigate any cover within 100 yards of the general route of march of the patrol. Flankers may become impracticable because of reduced visibility in dense woods or jungle. Then the men normally assigned to flank protection move with the patrol itself. They maintain close observation to their assigned flank.

Rear Point

A small patrol normally has only one rifleman assigned as rear point. He remains in sight and within about 50 yards of the last man of the patrol. This rifleman maintains rear security for the patrol by constantly observing to the rear. If the patrol is ambushed, he stays out of the fire fight. If the patrol is annihilated or obviously will be, he is the getaway man and returns to friendly lines to report the situation.

The rear point varies in size depending on the enemy situation and the size of the patrol. Usually, keeping a sharp lookout to the rear to prevent a surprise enemy attack from that direction is necessary.

MOVEMENTS

Before leaving friendly lines, the patrol leader must select a route to his final destination. This may be done on a map, on an aerial photograph, or on the actual ground to be covered. He should select intermediate objectives along that route. These successive objectives regulate the progress of the patrol.

A patrol should always designate one or more rallying points where it can reassemble if it is dispersed, ambushed, or surprised by enemy attack. Normally, an intermediate objective becomes the rallying point as the patrol moves beyond it. In this way, the patrol leader can be sure each individual of the patrol is thoroughly familiar with the rallying point locations.

Members of a dispersed patrol should try to reach the designated rallying point quickly so the mission may be readily resumed. If the patrol leader does not arrive within a reasonable period, the second in command reorganizes the patrol and carries out the mission.

SPECIAL ORGANIZATION

A special organization is simply a general organization varied to suit a particular mission or particular circumstances. For example, for an area reconnaissance, a patrol might be organized into several reconnaissance teams with each team providing its own security and NO separately organized security element. However, the patrol leader uses the same security techniques he uses for a day patrol, modifying them only as necessary.

PATROL PLANNING AND PREPARATION

The first requirement for a patrol leader is a thorough understanding of the patrol order. Be sure you clearly understand all of the instructions and make notes. After you have heard the order, if there are points on which you are not entirely clear, ASK QUESTIONS.

To make the best use of time, facilities, and personnel, the squad leader and the fire team leader follow a standard procedure (listed below) while preparing for and executing assigned missions. Depending upon the circumstances and the type of operation, the leader may take some steps before he takes others. At times, some steps may not be required or may not be possible because of time limitations. Time is the governing factor in applying patrol planning steps. All steps should be considered, although the degree of consideration of each may vary. The normal sequence is as follows:

1. Study the mission.
2. Plan use of time.
3. Study terrain and situation.
4. Organize the patrol.
5. Select men, weapons, and equipment.
6. Issue the warning order.
7. Coordinate (continuous throughout the patrol).
8. Make reconnaissance.
9. Complete detailed plans.

10. Issue patrol order.
11. Supervise (at all times), inspect, rehearse, and reinspect.
12. Execute the mission.

STUDY THE MISSION

The patrol leader carefully studies the mission. Through study of the mission, the terrain, and the situation, he identifies the essential tasks to be accomplished to execute the mission. These essential tasks become missions of the patrol's elements and teams for which the organization, personnel, and equipment must be considered.

PLAN USE OF TIME

The first step in planning is to allot (approximately) the available time remaining before departure. As soon as you fully understand the order, mentally outline everything that must be done before you leave, and allot time for each *item*. *Start with the time of departure and work backward.* This procedure, called **BACKWARD PLANNING**, will help ensure that you have allowed time for all necessary actions.

STUDY TERRAIN AND SITUATION

Study the friendly and enemy situation closely for the effect that troop dispositions, strengths, and capabilities may have on your mission. These factors will influence the route you take, the size and organization of your patrol, and the weapons and equipment the patrol will carry.

Study the map of the terrain over which the patrol will operate. The nature of the terrain in the vicinity of the objective will determine the number of security teams needed and the manner in which you will conduct your leader's reconnaissance of the objective.

ORGANIZE THE PATROL

Organizing consists of determining the elements and teams required to accomplish the mission of the patrol. Organization of the patrol, either special or general, is given in the patrol warning order.

SELECT MEN, WEAPONS, AND EQUIPMENT

The patrol leader usually selects patrol members from the platoon or squad he commands. He should maintain the regular fire team or squad organization when possible. No man who may interfere with the mission should be included in the patrol. An example is a man with a cold. His coughing or sneezing might give the patrol away to the enemy.

The patrol takes along only those weapons absolutely necessary to the performance of the mission. The same criterion applies to the equipment. Five categories of equipment are usually required. They are as follows:

- **OBJECTIVE AREA** equipment. This is the equipment you will need to accomplish the mission. It includes such items as weapons and ammunition, demolition charges, and small stuff fiber line for binding prisoners.

- **EN ROUTE** equipment. This is equipment that assists or enables you to reach the objective. It includes such items as maps, compasses, binoculars, flashlights, wirecutters, and stream-crossing lines.

- **CONTROL** equipment. This is equipment for maintaining communications and control. It includes telephones, whistles, pyrotechnics, flashlights, and luminous tape.

- **WATER AND FOOD.** Every man normally carries a canteen of water. On a long patrol, each man may carry two canteens plus rations to cover mealtimes during absence. For a very long patrol, arrangements must be made to resupply food and water.

- **ROUTINE** equipment. This is the equipment patrol members normally carry. It includes the uniform and web equipment. Usually, each man carries his poncho and one extra pair of socks. Gloves, even in warm weather, are worn to protect the hands from thorns, sharp rocks, and barbed wire.

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ISSUE THE WARNING ORDER

To give individual patrol members maximum time to prepare, the patrol leader should issue a **WARNING ORDER** to ALL members as soon as possible after the patrol order is received. The warning order should include the following.

- A brief statement of the situation so that patrol members will know what friendly and enemy units are doing.

- The mission of the patrol, given exactly as it was received.

- General instructions

General instructions should include the following:

- The patrol's general or special organization—that is, assigning specific tasks to specific elements.

- The specified uniforms, including any camouflage and identification measures.

- The specific weapons, ammunition, and equipment.

- The individuals who are to accompany the leader on reconnaissance and who will supervise subcategories of preparation.

- Instructions for obtaining water, rations, weapons, ammunition, and equipment.

The chain of command. (In a patrol composed of personnel from different units, the patrol leader establishes a chain of command.)

The time schedule. (The time schedule includes mealtimes and the time, place, and uniform for receiving the patrol leader's order.)

COORDINATION

In general, coordination means the arrangements made by other units to cooperate in the mission of the patrol. Examples are as follows:

Friendly units in whose areas the patrol will operate must be informed so the patrol

will not be endangered by fire from other friendly units.

To depart from or reenter a friendly area, the unit occupying that area may be required to provide guides to lead the patrol around obstacles, such as mines or wire.

Friendly units may be called on to give the patrol fire support. Fire support is fire delivered for the purpose of aiding another unit by doing the following:

- Inflicting casualties on the enemy

- Diverting the enemy's attention from the patrol

- Concealing the movements of the patrol by smoke

- Providing illumination

- Giving the patrol directional guidance

You may be required to establish coordination with other units yourself, or some or all of your coordination may be established by the command. In the latter case, you must check to ensure that nothing required has been overlooked.

MAKE RECONNAISSANCE

While the patrol is preparing for the mission, the leader should make a visual reconnaissance, when possible, to get information not available on the map. This should be an aerial reconnaissance, if possible. Check the route to be followed, noting prominent features of the terrain and any signs of enemy activity. If an aerial reconnaissance is impossible, try to find a good point to observe the area.

COMPLETE DETAILED PLAN

After the patrol leader has received the patrol order, issued the warning order, and made a reconnaissance, he prepares a detailed plan for

accomplishing the mission. This plan includes the following:

The specific duties of each element.

The route of return and an **ALTERNATE** route, in case of detection by the enemy.

Patrol conduct, such as

- the formation to maintain and the order of movement to follow,
- points of departure from and reentry into friendly areas,
- rallying points and action to take there,
- action to take on enemy contact,
- action to take in danger areas, and
- action to take at the objective.

Check to ensure that all the weapons, ammunition, and equipment specified in the warning order were obtained.

Disposition to be made of own wounded and enemy prisoners.

Signal system to use.

Report system to follow.

Challenge and password to use not only within the patrol but also in areas covered by other friendly units.

Check to ensure that everybody has a place in the chain of command.

Location of leaders—that is, where the leader plans to be in the formation, and where the leader plans to station the assistant patrol leader.

ISSUE OF PATROL ORDERS

A patrol leader should issue orders in a clear, concise, and forceful manner. Follow the standard operation order format, as shown in figure 8-24 of chapter 8. All patrol members should be present. The patrol leader precedes the order with a complete oral description of the plan and answers all questions after completing the order.

SUPERVISE, INSPECT, REHEARSE, AND REINSPECT

The patrol leader should hold a **REHEARSAL** of the mission, even if the patrol is thoroughly experienced. Before the rehearsal, the leader should hold an **INSPECTION** to determine the state of readiness, both physical and mental, of the men. The patrol leader will satisfy himself as to the completeness and correctness of uniform, weapons, and equipment. Then he will question the men to ensure that each man knows the following:

- The planned operations of the patrol
- The part he will play
- What others will do, insofar as their actions relate to him
- All challenges, passwords, reporting times, and any other significant details

A rehearsal improves the operational proficiency of the patrol and allows you to check the plans and to make any needed changes. If the patrol is to operate at night, conduct both day and night rehearsals. If possible, use terrain similar to that over which you will operate. If time permits, rehearse all actions. Where time is limited, rehearse critical actions. Action at the objective is the most critical phase of the patrol and should always be rehearsed.

Supervision is continuous by all patrol leaders throughout the planning, preparing, and completing of the patrol mission.

EXECUTE THE MISSION

The successful completion of a patrol will be the end result of the continuing efforts of every patrol member, including yourself, who has earnestly applied knowledge, skills, and ingenuity to accomplishing the mission.

Some of the principles to follow in the conduct of your patrol and some of the techniques you may use are given below. Remember, details vary with different circumstances.

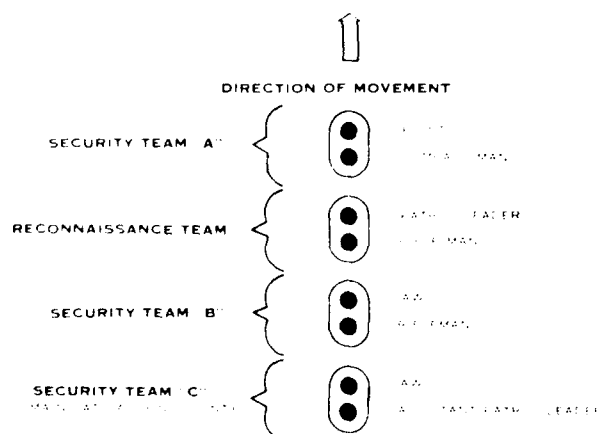
Formation and Order of Movement

The elements of the patrol are established by its general organization. The formation in which the patrol moves forward and the location of elements in the formation are called **ORGANIZATION FOR MOVEMENT**. An example of a reconnaissance patrol organization for movement is shown in figure 12-1. An example of a combat patrol organization for movement is shown in figure 12-2.

Departure and Reentry of Friendly Areas

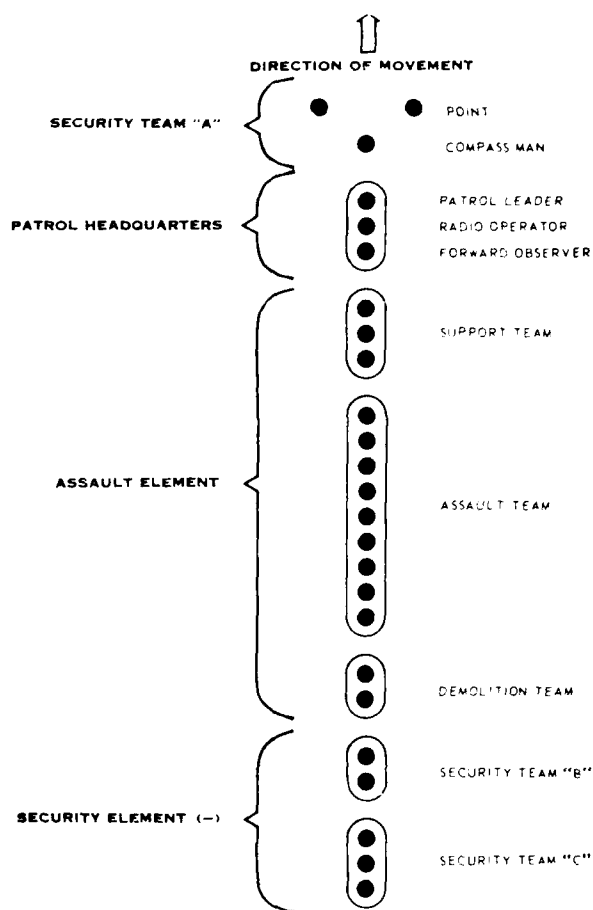
Move cautiously when you approach positions in friendly areas; you will be regarded as an enemy until identified otherwise. The patrol leader should halt the patrol near the position; then go forward and contact the position and, if possible, the local **LEADER**. He takes at least one man with him. He may take more if the situation permits, but remember that unusual activity at a forward position may attract enemy attention. The patrol leader tells the personnel at the position any information they may need to assist him, such as the size of his patrol, his general route, and his expected time of return.

Request the latest information on the enemy, the terrain to the front, and any known obstacles or dangers. Check for any communication



45.600

Figure 12-1.—Example of reconnaissance patrol organization for movement.



45.601

Figure 12-2.—Example of combat patrol organization for movement.

facilities, fire support, and other assistance they can give you. Check the challenge and password, and determine that the same personnel will be manning the position when you return. If they will not, ask them to be sure to relay information about the patrol to the relief. If you will be out longer than one day, obtain the challenge and passwords for each day you will be out.

Rallying Points

A rallying point is a designated place where a patrol that has been dispersed can assemble and reorganize. It should provide cover, concealment, and be defensible for at least a short time. It

must be easily recognizable and be known to all members of the patrol. Until a rallying point has been actually reached and found to be suitable, it is designated as a **TENTATIVE RALLYING POINT**. To designate it as a definite rallying point, the patrol leader halts the patrol when he arrives there. He then announces, "This is a rallying point," and points out the identifying features.

There are three **TYPES** of rallying points. They are as follows:

1. **INITIAL** rallying point. This is a point within the friendly area where the patrol can rally if it becomes scattered before leaving the friendly area or before reaching the first tentative rallying point outside the friendly area.

2. **EN ROUTE** rallying point. This is a rallying point lying between the foremost friendly area and the objective.

3. **OBJECTIVE** rallying point. This is a rallying point near the objective where the patrol will assemble after accomplishing the mission.

The patrol leader must select and designate a tentative initial and objective rallying point before the patrol starts off. If these points prove suitable when he reaches them, then he confirms them by declaring them rallying points. He will select other points en route as he reaches suitable locations.

The following are general rules for the use of rallying points:

1. Select the initial and the en route rallying points to prevent complete disintegration of the patrol if it is unavoidably dispersed before reaching the objective.

2. The objective rallying point makes it possible for the patrol to reassemble after it has dispersed to carry out the objective.

3. If the patrol is dispersed in a friendly area, it reassembles at the initial rallying point.

4. If the patrol is dispersed between the initial rallying point and the first en route rallying point, it will assemble at one or the other of these points. The patrol leader must designate in his patrol order whether he desires reassembly at the initial rallying point or the first en route rallying point.

5. If the patrol is dispersed between en route rallying points, it will assemble either at the last rallying point or at the next (tentative) rallying

point. Again, the patrol leader must designate which of these alternatives he desires. In this and the former case, circumstances will control his decision.

Action on Enemy Contact

A patrol is subject to two types of enemy contact: (1) **CHANCE** contact, and (2) **AMBUSH**. In chance contact, you come on the enemy unexpectedly, and the enemy is not prepared to deal with you. In ambush, you are subjected to an intentional surprise attack by an enemy who is concealed and lying in wait.

In a chance contact, you must break contact as quickly as possible and continue the mission. If you engage the enemy any longer than necessary, you could jeopardize the mission. The "clock" system is one way of breaking contact. The line of direction along which the patrol is moving is considered to be 12 o'clock. If the patrol leader called out "Ten o'clock—200," that would order the patrol to move off 200 yards in the 10 o'clock direction. The patrol must, as far as possible, keep the original formation.

FIRE AND MOVEMENT is another way of breaking a chance contact. One portion of the patrol returns enemy fire while another portion moves off. The two groups alternate covering fire and movement until both have broken contact.

In an ambush, you may have the alternative of an assault in force to break through the ambush or a withdrawal like that used in a chance contact. However, a well-placed ambush usually prevents withdrawal by the flank. If you must break through by assault, quickly determine the point of weakest enemy fire and assault this point with maximum firepower.

Action at Patrol Objectives

On a reconnaissance patrol, the patrol leader halts and conceals the patrol near the objective; the place where he does this will usually be the objective rallying point. He conducts a leader's reconnaissance to pinpoint the objective, then returns to the patrol and positions security teams according to plan. He places these where they can best provide early warning of enemy approach and best cover the reconnaissance element. Then he reconnoiters the objective.

The patrol leader may be able to get the required information quickly and simply. But it is more likely that he will have to move to several positions, perhaps making a circle around the objective. If he must do this, he instructs the assistant patrol leader to continue the mission if he doesn't return within a reasonable time. When the reconnaissance is complete, the patrol leader assembles the patrol at the objective rallying point and tells everyone what he saw and heard. He has each man contribute anything significant that may have been seen or heard. He makes a preliminary report by radio if possible; then he returns to the unit as quickly as possible and makes a full report.

AMBUSH

An ambush is a surprise attack from a concealed position upon a moving or temporarily halted target. It is one of the oldest and most effective types of military operations. Ambush may include assault to close with, and decisively engage, the target or the attack may be by fire only. Ambush is highly effective in conventional operations but is even more suitable and effective in guerrilla and counter guerrilla operations.

Ambush is a favorite tactic of guerrilla forces because it does not require that ground be seized and held. Also, it enables small forces with limited weapons and equipment to harass or destroy larger, better armed forces.

It is an effective counter guerrilla measure because it forces the guerrillas to engage in decisive combat at unfavorable times and places. An ambush denies the guerrillas the freedom of movement on which their success so greatly depends. It deprives the guerrillas of weapons, ammunition, and equipment that is very difficult to replace; and the death or capture of "hard core" personnel greatly weakens the guerrilla force.

Ambushes are executed for the general purpose of reducing the enemy's overall combat effectiveness and for the specific purposes of destruction and harassment. Destruction is the primary purpose because the loss of men killed or captured and the loss of equipment and supplies destroyed or captured critically affects the enemy. The capture of equipment and supplies may assist our forces.

Harassment is a secondary purpose. Though less apparent than physical damage, it is very important. Frequent ambushes force the enemy to divert men from other missions to guard convoys, troop movements, and carrying parties. When patrols fail to accomplish their missions because they have been ambushed, the enemy is deprived of the valuable contributions these patrols would make to his combat effort. A series of successful ambushes causes the enemy to be less aggressive and more defensive. They become apprehensive and overly cautious. They become reluctant to go on patrols, to move in convoys, or to move in small groups. If ambushed, they seek to avoid night operations, are more subject to confusion and panic, and generally decline in effectiveness.

The two main types of ambush are point ambush and area ambush. A **POINT AMBUSH** is one where forces are deployed to support the attack of a single killing zone. An **AREA AMBUSH** is one where forces are deployed for multiple, related point ambushes.

In a deliberate ambush (an ambush planned as a specific action against a specific target), detailed information about the target is required: the size, nature, organization, armament, equipment, route of movement, and the times the target will reach or pass certain points on its route. There are two situations where deliberate ambushes should be planned. The first situation is when you receive reliable information on intended movement of a specific force; the second is when patrols, convoys, carrying parties, or similar forces establish patterns of size, time, and movement sufficient to permit detailed planning for this ambush.

The ambush of a target of opportunity is often the action of a search and attack patrol. When available information does not permit the detailed planning required for deliberate ambush, an ambush of opportunity is planned. Then the ambush force plans and prepares for the ambush and attacks the first suitable target appearing. A search and attack patrol, before departing, plans and rehearses the ambush of the types of targets it may encounter. It establishes and executes ambushes as targets of opportunity arise.

FUNDAMENTALS OF SUCCESSFUL AMBUSH

Surprise, coordinated fire, and control are the basic elements essential to successful ambush.

Surprise must be achieved or the attack is not an ambush; surprise distinguishes ambush from other forms of attack. Also, surprise allows the ambush force to seize and retain control of the situation. If complete surprise cannot be achieved, it must be so nearly complete that the target is not aware of the ambush until too late for effective reaction. Surprise is achieved by careful planning, thorough preparation, and exact execution. Only through detailed planning and thorough preparation can you make a sound decision on when, where, and what type of targets you should or should NOT attack and how you will attack so that the enemy is LEAST prepared.

All weapons, including mines and demolitions, must be positioned. All firepower, including that of available artillery and mortars, must be coordinated to achieve the isolation of the killing zone to prevent escape or reinforcement. An ambush must also achieve the surprise delivery of a large volume of highly concentrated fire into the killing zone. The fire must inflict maximum damage so that, when desired, you can speedily assault and completely destroy the target.

Close control must be maintained during movement to, occupation of, and withdrawal from the ambush site. The ambush commander must effectively control all elements of the ambush force. Control is most critical at the time of approach of the target. Control measures must provide for the following:

1. Early warning of target approach
2. Withholding of fire until the target has moved into the killing zone
3. Opening fire at the proper time
4. Initiation of the right actions if the ambush is prematurely detected
5. Lifting or shifting of supporting fires when the attack includes assault of the target
6. Timely and orderly withdrawal of the ambush force to an easily recognized rallying point

The men of the ambush force must maintain the maximum control themselves so they do not

compromise the ambush. They must use patience and self-discipline by remaining still and quiet while waiting for the target to appear. They may have to forego smoking, endure insect bites, thirst in silence, and resist the desire to sleep, to ease cramped muscles, and to perform normal body functions. When the target approaches, the men must resist the temptation to open fire before the signal is given.

POINT AMBUSH

A point ambush can be used independently or as part of an area ambush. In a point ambush, the attack force is positioned along the target's expected route of approach. The formation is an important consideration because it determines if a point ambush is able to deliver the heavy volume of highly concentrated fire necessary to isolate, trap, and destroy the target.

The formation is determined by careful consideration of possible formations and the advantages and disadvantages of each in relation to the following:

1. The terrain, conditions of visibility, forces, weapons, and equipment
2. The ease or difficulty of control, and the target to be attacked
3. The overall combat situation

In this manual, we discuss a few formations that have been developed for the deployment of point ambushes. Those discussed are identified by giving them names that correspond to the general pattern formed on the ground by the deployment of the attack force.

Line

The attack force is deployed generally parallel to the target's route of movement (road, trail, stream, and so forth). This positions the attack force parallel to the long axis of the killing zone and subjects the target to heavy flanking fire. The area that the attack force can effectively cover with a heavy volume of highly concentrated fire limits the size of the killing zone that can trap the target. The target is trapped in the killing zone by natural obstacles, mines (Claymore, antivehicular, and antipersonnel), demolitions,

and direct and indirect fire. A disadvantage of the line formation is the chance that lateral dispersion of the target may be too great for effective coverage. The line formation is appropriate in close terrain that restrict target maneuver and in open terrain where one flank is restricted by natural obstacles or can be restricted by mines, demolitions, mantraps, or stakes. Similar obstacles can be placed between the attack force and the killing zone to provide protection from the target's counterambush measures. When a destruction ambush is deployed in this manner, access lines are left so that the target can be assaulted. An advantage of the line formation is its relative ease of control under all conditions of visibility.

The L

The L-shaped formation is a variation of the line formation. The long side of the attack force is parallel to the killing zone and delivers flanking fire. The short side of the attack force is at the end of, and at right angles to, the killing zone and delivers enfilading fire that interlocks with fire from the other leg. This formation is very flexible. You can establish it on a straight stretch of a trail, stream, or at a sharp bend in a trail or stream. When appropriate, fire from the short leg can be shifted to parallel the long leg if the target attempts to assault or escape in the opposite direction. In addition, the short leg prevents escape in its direction and reinforcement from its direction.

The Z

The Z-shaped formation is another variation of the line formation. The attack force is deployed as in the L formation, but with an additional side so that the formation resembles the letter Z. The additional side may serve any of the following purposes:

1. To engage a force attempting to relieve or reinforce the target
2. To seal the end of the killing zone
3. To restrict a flank
4. To prevent envelopment

The T

In the T-shaped formation, the attack force is deployed across and at right angles to the target's route of movement so that the attack force and the target form the letter T. This formation can be used day or night to establish a purely harassing ambush and, at night, to establish an ambush to stop or hamper enemy movement through open, hard-to-seal areas, such as rice paddies.

A small force can use the T formation to harass, slow, and disorganize a larger force. When the lead elements of the target are engaged, they will normally attempt to maneuver right or left to close with the ambush. Mines, mantraps, and other obstacles placed to the flanks of the killing zone slow the enemy's movements. They also permit the ambush force to deliver heavy fire and withdraw without becoming decisively engaged. An ambush established and executed in this manner is called a "bloody nose" ambush.

The T formation can be used to stop or hamper small groups attempting night movement across open areas. For example, you can deploy the attack force along a rice paddy dike with every second man facing in the opposite direction. The attack of a target approaching from either direction requires only that every second man shift to the opposite side of the dike. Each man fires only to his front and only when the target is at very close range. Attack is by fire only and each man keeps the target under fire as long as it remains on his front. If the target attempts to escape in either direction along the dike, each man takes it under fire as it comes to his vicinity. The T formation is very effective at halting infiltration. But it has one chief disadvantage—there is a possibility that the ambush will engage a superior force at night while spread out. Therefore, use of this formation must fit the local enemy situation.

The V

Deploy the V-shaped attack force along both sides of the target's route of movement so that it forms the letter V. Care is taken to ensure that neither group or leg fires into the other. This formation subjects the target to both enfilading and interlocking fire. The V formation is best

suited for fairly open terrain but can also be used in the jungle. When established in the jungle, the legs of the V close in as the head elements of the target approach the apex of the V and open fire from close range. Here, even more than in open terrain, all movement and fire must be carefully coordinated and controlled to ensure that the fire of one leg does not endanger the other. The wider separation of forces makes this formation difficult to control, and there are fewer sites that favor its use. Its main advantage is that it is difficult for the target to detect the ambush until well into the killing zone.

COUNTERAMBUSH DRILLS

When a patrol is ambushed, the immediate action drill used is determined by whether the ambush is near or far.

In a NEAR ambush, the killing zone is under heavy, highly concentrated, close-range fire. There is little time or space for men to maneuver or seek cover. The longer they remain in the killing zone, the more certain their destruction. Therefore, if attacked by a NEAR ambush, the patrol should react as follows:

1. Men in the killing zone, **WITHOUT ORDER OR SIGNAL**, immediately assault directly into the ambush position, occupy it, and continue the attack, or break contact as directed. This action moves them out of the killing zone, prevents other elements of the ambush from firing

on them without firing on their own men, and provides positions from which other actions may be taken.

2. Men not in the killing zone maneuver against the attack force and other elements of the ambush as directed.

3. To eliminate the ambush or to break contact, the men continue the attack as directed.

In a FAR ambush, the killing zone is also under heavy, highly concentrated fire but from a greater range. This greater range provides men in the killing zone some space for maneuver and some opportunity to seek cover at a lesser risk of destruction. Therefore, if attacked by a far ambush, the patrol should react as follows:

1. Men in the killing zone, **WITHOUT ORDER OR SIGNAL**, immediately return fire, take the best available position, and continue firing until directed otherwise.

2. Men not in the killing zone, maneuver against the ambush force as directed.

3. To eliminate the ambush or to break contact, the men continue the attack as directed.

In each situation, the success of the counterambush drill used is dependent on the men being well trained in recognizing the nature of an ambush and well rehearsed in the proper reaction.

CHAPTER 13

TROOP MOVEMENT AND BIVOUAC SITES

Troop movements are classified as administrative or tactical. Administrative troop movements are made when ground contact with the enemy is not a consideration and when there is no need for special security requirements other than secrecy and those necessitated by enemy long-range aircraft and missiles and intelligence operations. In an administrative troop movement, the emphasis is on the economical use of transport equipment. This is achieved by proper organization of the movement and the loading.

Tactical troop movements are made under combat conditions; troops and equipment are organized, loaded, and transported according to their tactical mission. Emphasis is placed upon the unit accomplishing the mission immediately upon arrival at its destination. Therefore, security measures are a vital consideration. When a tactical move is made, the overriding consideration is the requirements of the tactical situation rather than the efficient, economical use of transportation (the mission) facilities.

A successful movement places troops at their destination at the proper time and keeps them organized so they can defend themselves while moving and while completing their mission.

The objective of this chapter is to point out that the basic planning and preliminary steps required for the movement of a motor march apply to all types of movements, administrative or tactical. In addition, this chapter will point out the basic steps required in selecting and organizing a bivouac site.

TROOP MOVEMENTS

In the SEABEES, you will have the occasion to move by all modes of transportation, from foot

to jet aircraft. The rapid, secret, and efficient concentration of troops is one element essential to a successful battle plan. Successful troop movements result from careful planning. Plans must be executed so the troops arrive at their destination in the best possible condition to accomplish their combat mission. Strict adherence to the prescribed schedules and routes must be emphasized. Critical checkpoints must be reached at the time specified or confusion and interference with other elements (units) may result. Maintenance of control, command unit, and combat effectiveness of the troops throughout the movement is extremely critical for success.

All troop movements have many things in common. Troops move as integral units, retaining their normal organizational structure. Squads move as squads, platoons move as platoons, and so on. Moving this way, they should always be capable of any type of action required of their size or type of unit, in the minimum of time—even en route. Equipment, personnel, and any baggage not carried by the men are accounted for by means of checklists.

When a SEABEE battalion is ordered to move to carry out an assigned mission, it must take its equipment with it. The equipment may precede the battalion, travel on the same carrier, or follow it.

With its organic (assigned) allowance of vehicles, an NMCB cannot move all its equipment and personnel by vehicle in one loading. Therefore, the unit must request more vehicles or it will have to make additional trips with its assigned vehicles in a shuttling operation. (Shuttling operations are explained under "Motor March.")

UNIT TROOP MOVEMENT STAGES

Unit troop movements are divided into three stages: training, alert, and movement. The training stage begins at the time the unit is organized and extends to the time it receives the warning order alerting it for movement. The alert stage starts when the unit is informed it is to move and extends until receipt of the movement order. The movement stage begins upon receipt of the movement order and extends until the unit has arrived at its destination.

Training Stage

A company or an NMCB should start to prepare for its combat mission at the time of its activation. This mission may require actively engaging the enemy and furnishing combat service support or both. Before a unit can perform either mission, it must be transported to the theater of operations or to the location where it is to perform its combat role. This movement can easily become complicated and confusing unless it is based on careful planning and thorough training. Therefore, training for movement should be specified in the training program for each unit.

The speed with which selected units must move to support contingency plans or other immediate operational requirements does not always allow them to follow fully the normal procedures for preparing for movement and the logical order of preparation. Many of the actions normally carried out after receipt of the warning order must be performed at the same time as the instructions given during the training stage. Checklists of the work or actions required prior to a move should be made. They are intended for use during the alert stage that normally extends from the receipt of the warning order until receipt of the movement order. Under emergency conditions, a commander may use these checklists to determine the status of his unit's operational readiness; or under actual movement he uses them to ensure that all preparations and actions are complete and that everyone is on hand and ready to move.

Alert Stage

After the decision to move has been made, the first step is to issue a warning order. The

command channels issue the warning order through channels. This order serves as an advance notice that an organization is to be moved. If time permits, the order usually is issued about 90 days in advance of the readiness date (departure). This allows the subordinate elements (commands) time for preparation. A warning order answers as many of the following questions as possible.

- Who—The unit or units involved
- What—The nature of the movement
- When—The time the movement is to begin
- Where—The destination
- Why—The general purpose of the operation

During the alert stage, you should hold showdown inspections to ensure all equipment and supplies authorized or needed for the move are on hand and in satisfactory working condition. If they are not, take immediate action to bring your unit up to its authorized allowance. You should order any special equipment, maintenance, or supplies required for the move. If your personnel strength is not up to authorized allowance, immediately notify your next higher command of your shortages. If some items are serviceable but their length of serviceability is doubtful, try to acquire new or rehabilitated replacement parts. In other words, try to arrive at your new destination with the best possible equipment, material, and supplies and a full complement of personnel. Also, try to be as self-supporting as possible, giving your normal supply channels a chance to organize and function without undue, immediate pressure to supply you.

Movement Stage

So the commander or commanders of the unit or units notified by a warning order of an impending move can make more thorough moving preparations, a movement order from higher commands should be received approximately 75 days (when time permits) before the effective date of the move. This order provides authority to initiate the supply personnel and administrative procedures required by the move

and NOT authorized by the warning order. To aid the commander or commanders concerned, it MUST contain, as a minimum, all the following information.

Who—Unit or unit to move

What—Number of personnel and amounts of baggage, equipment, and accompanying supplies to be moved

When—Date and time available for movement and required arrival or both

Where—Origin and destination of movement

How—By air, rail, or ship and so forth (this is for planning purposes only; it could be changed)

Why—Purpose of move

Type of movement—Temporary or permanent

Movement organization—Composition of movement increments; that is, advance party, main body, and rear element; instructions to the movement staff, packing, loading, documentation teams, and guards; and procedures to be used at home station, en route, and at the destination

Also, each unit should prepare loading plans and checkoff lists if they do not already exist from the training stage. These lists ensure that equipment, materials, and supplies and the authorized allowance of personnel required for the mission are on hand, in the best of condition, and ready to make the move. Good organization, prior training of personnel, maintenance of equipment, and good physical conditioning lead to a more successful move. The above information applies to both tactical and administrative moves, even an overseas movement from the United States or from one theater of operations to another. It is general information you need for moves. To be more specific, let us go into the planning steps for a motor march and a forced march.

MOTOR MARCH

A motor march can be made with a battalion's organic vehicles, with another battalion's vehicles, or a combination of the two. If not enough vehicles are available, the motor march can be

combined with a foot march as a shuttling operation. The available vehicles take as many troops as they can safely carry to a predesignated forward location as the rest of the troops start out on foot in the same direction. The vehicles will then off-load, returning to pick up the advancing foot troops that could not be loaded when the other troops were transported. This group is then moved to a second predesignated spot that is well ahead of the first predesignated forward location as the first troops loaded are now proceeding as a foot march. In other words, it is a leapfrog motion until all troops arrive at their final destination. One point to remember—do NOT delay in moving out the troops after they fall in to begin the march. This type of action is discouraging and fatiguing to your men and should be avoided.

Preparation for a Motor March

The following actions are just a few of many that should be done before a motor march to make it successful. These actions are described to give you an idea of what types of things have to be done before and during the motor march.

The actions you take before the march should be done as far in advance as common sense, time, and experience allow. For example, give rations out NO earlier than the night before the scheduled march—this will help ensure that the troops do not eat them earlier. Be sure the vehicles have been topped off with fuel (preferably the night before); have troops fill their canteens and water cans (preferably the night before); issue enough ammunition to bring all troops up to authorized allowances if it is to be a tactical march (day before); and issue a minimum of 1-day's field rations (preferably the night before), unless hot meals can be served en route. Try to serve at LEAST one hot meal at the end of each day. You must assign march security for a tactical march. This will be explained in detail later under "March Security." Finalize arrangements for all personnel sick or unable to make the move (as soon as possible after being alerted); appoint the sanitation officer and a police detail to stand by until after the camp has been cleared and see that the campsite is left in a clean and sanitary condition.

SEABEE COMBAT HANDBOOK

While the troops are en route, ensure that they drink enough water to replace the fluids lost by perspiration during the march. Trained troops can lose 6 pints and untrained men 2 pints of water without serious discomfort. When untrained troops lose 2 pints by evaporation they should be allowed to sip water slowly from their canteens. Normally, it takes about 2 hours of marching to lose 2 pints of water by evaporation. The troops should consume 1 pint or more of water at meal times in addition to what they drink during the march. Extra salt may be used with each of the three daily meals. Salt tablets, if needed, should be taken only at the direction of a corpsman. The extra salt content will slow down the evaporation of the body liquids under conditions of extreme heat or cold. Experienced troops know instinctively how much water they need—inexperienced troops have a tendency to get waterlogged and tire easily.

Rate of March

The slowest moving unit in the convoy governs the distance covered by a motor march in a day. This will usually be a heavily loaded low boy or a self-propelled piece of construction equipment.

The interval between vehicles and units is determined by the speed of the column over each section of the route. Remember that the slowest vehicle sets the pace as given by the march commander. To reduce traffic congestion, march commanders often separate the column into units of vehicles traveling at about the same speed and have the columns travel independently from each other.

If part of the troops must march on foot, they should start out ahead of the vehicles. The distance between the men, when marching on roads during daylight, may vary from 2 to 5 yards to provide dispersion and enough space for marching comfort. A distance in excess of 5 yards will increase the length of the column and make control more difficult. At night, the distance should be reduced to 1 to 3 yards between men to help maintain contact and facilitate control. The tactical situation may bring about a change of the above distances. For example, if the march route is within range of enemy artillery fire, the maximum of the stated distance should be used.

Normal distances between units are 100 yards between companies and 50 yards between platoons. At night or during periods of reduced visibility, the distances may be decreased to 50 yards between companies and 25 yards between platoons to facilitate control. In daylight, when the terrain is extremely rugged, or when the column is marching within the range of artillery, the distances should be increased to meet the needs of the situation and the amount of control required. The above distances are enough to permit vehicles to pass the column.

It is desirable to arrive at the end of the march as early in the day as practicable so camp may be made during daylight to provide maximum rest for the troops.

Halts

Halts are made for rest, personal comfort, and relief; messing; refueling, maintenance, and inspection of equipment; and allowing other traffic to pass.

The time and duration of halts as well as their purpose are usually prescribed in orders from higher headquarters. A halt of 15 minutes is normally made at the end of the first hour, with a 10-minute halt every 2 hours thereafter. One-half hour to 1 hour is generally allowed for mess and refueling halts. When others must pass and the situation permits, mess and refueling halts should be scheduled to coincide, using necessary delay to advantage. Long halts during the day are not made unless required by special conditions. To maintain proper gaps between units (companies, platoons, or squads), all elements must halt at the same time. During radio silence or when communications are inadequate between units, the time of each halt may be scheduled in the orders.

LOCATION OF SCHEDULED HALTS.—

The locations for scheduled halts should be selected in advance, specifically ordered, and plotted on road movement graphs. These locations may be prescribed by higher authority, made tentatively by map reference and aerial photos, or made by the reconnaissance party. On dispatch routes, highway regulation points may include refueling stations, messing facilities, temporary quarters, and maintenance facilities.

When such facilities have been provided, highway regulation orders or other orders from higher headquarters usually prescribe the places at which halts will be made.

If the halt is brief and will not interfere with normal traffic flow, the column may stop on the shoulder of the road. Halting places, especially off-road areas, should have a turn-around area or detour routes so the column may be quickly reversed or be able to reenter the route when necessary.

If crossroads, railroad crossings, or similar danger points lie within the halt area of a column, subordinate commanders will require vehicles to stop a reasonably safe distance from them; no part of a column should stop on bridges. Also, halts on steep grades and sharp curves should be avoided.

The comfort of personnel and servicing facilities for vehicles are important considerations in selecting sites for long halts. If a column starts from a populous area, its first halt should be delayed, when practicable, until a rural area is reached to facilitate personal relief of personnel. For the same reason halts should not ordinarily be made in villages or towns unless there is a special need.

PRECAUTIONS TAKEN AT HALTS.—

Columns should be halted at points that provide a clear view of the column 200 yards or more from the front and from the rear of the column. If road conditions prevent adequate sight distances, take steps to forewarn approaching traffic.

Guards, warning flags, caution lights, or flares (security conditions permitting) should be posted in the front and the rear of the column and at any other points where there is a hazard to passing traffic. At times, the column may block part of the road at the halt, and one-way traffic will be necessary. Then alternate authorized traffic movements are accomplished by using flags transmitted from one end of the single lane to the other by the last vehicle of each passing group. You may also use guards to control traffic by signals.

When the column halts on the traveled way, forcing traffic moving in the same direction to cross the center line, park vehicles with enough distance between them to allow passing vehicles to enter the column upon the approach of vehicles from the opposite direction.

Unless otherwise prescribed, when traffic approaches from the rear of the halted column and cannot clear the column before it starts to move again, officers may require such traffic to remain behind until it is safe to pass.

On halts, all personnel other than traffic guides must remain off the road to the right of their assigned vehicles, keeping the traveled portion of the road clear at all times. Men are not permitted to leave the immediate vicinity of their unit or vehicle during halts without specific authority from an officer of their unit.

DUTIES AT HALTS.—At halts, officers and petty officers should check the welfare of personnel, the security of the loads, and the performance of first echelon maintenance. Control personnel will make necessary inspections and give instructions to ensure prompt resumption of the movement with a minimum of confusion at the end of the halt. Mess, medical, and maintenance personnel should perform any special duties as the purpose and duration of the halt permit.

When the column is halted for any reason other than the hourly halt, the commander halts the leading element. When possible, troops should be informed of the length of each halt so they can take full advantage of it. Troops should NOT leave their vehicles on a halt until given an order to do so.

March Discipline

The march commander attains march discipline through training and through internal control within the marching unit. Discipline is indispensable to the effectiveness of the march column. The specific objective of march discipline is to ensure intelligent cooperation and effective teamwork on the part of all march personnel. Such cooperation and teamwork can be attained only by thorough training, constant supervision by every officer and petty officer, practical experience in a march, and meticulous attention to the details of the techniques listed below.

1. Correct driving
2. Immediate and effective response to all signals and orders
3. Prompt relaying of visual signals

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4. Strict obedience to traffic regulations, rules of the road, and highway instructions that regulate traffic control and command personnel

5. Effective use, as prescribed, of cover, concealment, camouflage dispersion, radio silence, blackout precautions, and other protective measures against air, ground, or CBR attack

6. Correct speeds, distances, and positions within the column

7. Observance of the rules of march hygiene

8. Proper care of equipment

The responsibility for good march discipline begins with the driver of each vehicle and increases with each commander charged with internal control. Briefly, their duties are as follows.

1. The driver of each vehicle is responsible for observing the proper distance and speed as directed by the convoy commander, for safety precautions, for good driving, for performing the prescribed first echelon maintenance, and for strictly observing all requirements of standing operating procedure or specific orders governing the march. The driver should be given adequate orientation on routing and the destination to ensure safe arrival in the event of unavoidable separation from the column, breakdown, and so forth. When time and facilities permit, he should be supplied with a map of the route.

2. The assistant driver should be constantly on the alert for column signals and warnings and for signs placed along the road; he is responsible for warning the driver and transmitting this information back along the column when proper. This is particularly important at night or under conditions of poor visibility. He should help the driver in every way possible, guarding against his falling asleep, assisting in at-halt maintenance service, and helping with emergency repairs.

3. Squad leaders supervise the actions of the drivers of the vehicles carrying their squads, giving particular attention to spacing of vehicles, the performance of first echelon maintenance, and the safety of their personnel.

4. Section leaders and platoon leaders or both supervise the actions of the squad leaders, giving them any instructions required for their sections or platoons to function properly.

5. The march unit leader or commander gives the order to move or halt and exercises general supervision over the conduct of his unit. He is responsible for maintaining the proper position of his march unit within a larger column and for carrying out the orders of the column commander.

6. Commanders in a convoy, column, or serial are responsible for their units; this responsibility becomes broader and more general in nature at each higher level of command.

Forced Marches (Foot Troops)

With foot troops, a forced march is generally made by increasing the number of marching hours; the halts and periods of cooking and sleeping are arranged to afford maximum benefit to the troops. The rules prescribed for an average foot march are followed as closely as possible. Forced marches seriously impair the fighting power of even the best troops and are undertaken only in cases of necessity.

Before any foot march, company commanders should make a thorough inspection of all their personnel. This inspection should include a detailed check of

1. feet and footwear,

2. clothing and the personal field equipment of each man, and

3. each man's physical fitness and ability to complete the foot march.

Too tight or too loose footwear and clothing or personal equipment could cause a march casualty. Commanders should take immediate action to correct such deficiencies. They should ensure that their men's socks do not have holes in them and that each man carries extra socks in case he wears holes in them or gets them wet during the march.

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Medical personnel should march at the rear of the formation to treat any sick or disabled personnel. The sick or injured should be treated and tagged, as necessary. Station a vehicle in the rear of the column to pick up any personnel who cannot continue the march on foot.

The usual foot march formation is the route column (column of twos or threes); the elements of the column cover and dress toward the file designated as guide. Under favorable conditions, troops can march 20 miles in an 8-hour day without undue fatigue. This averages out to 2 1/2 to 3 miles per hour. Of course, a forced march increases the marching time marched and/or has the troops do a quicker pace per hour or alternates double-time periods with the regular march pace.

In a friendly area, the commanding officer and his staff march at the front of each organization. In hostile areas, they usually march at the head of the main body, preceded by the security elements mentioned below.

Tactical March Security

For tactical marches, you have, in addition to all of the problems and required planning mentioned earlier in this chapter, the threat of enemy action being taken against your troops. This could be ambushes, land mines, enemy air attacks, or a full-fledged attack by enemy forces. To provide security against this threat of enemy action, security elements consisting of an advance guard, rear guard, and flank guards are formed.

If a force moves in more than one column, each is covered by its own advance guard. Elements not covered by the advance guard in their deployment for action likewise provide their own security detachments.

The following paragraphs describe the security measures considered necessary for the protection of a column or columns moving into hostile territory under conditions where contact with the enemy is possible.

TASKS AND DUTIES.—The principal tasks of advance guards are as follows.

- To ensure the uninterrupted advance of the main body
- To protect the main body against surprise and observation by hostile ground forces
- To cover the deployment of the main body when the enemy is encountered in enough strength to require the employment of the whole force

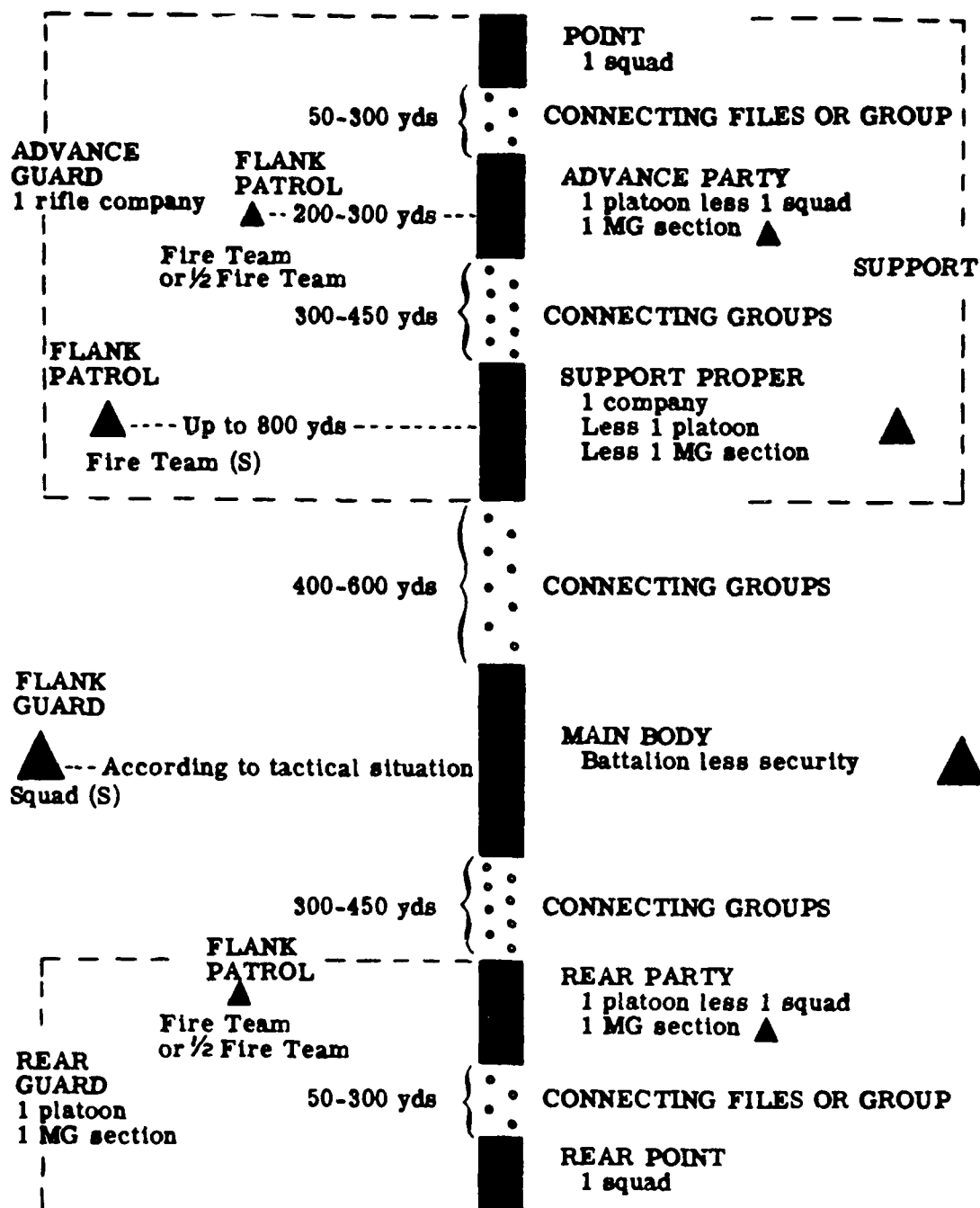
In accomplishing their mission, advance guards are required to do the following.

- Remove obstacles in the route of march, such as land mines and downed trees, and repair roads and bridges
- Reconnoiter to the front and flanks to secure information
- Drive back small bodies of the enemy, to prevent their observing, firing upon, or delaying the main body
- Secure terrain features that protect the main body from hostile fire and observation and that provide suitable positions for observing the fire of friendly supporting weapons
- Seize suitable commanding positions to cover the deployment of the main body when movement is definitely stopped, and determine the strength, disposition, and flanks of enemy forces

DISTRIBUTION TROOPS.—Advance guards are generally subdivided from front to rear as follows.

1. Point (sent out by the advance party)
2. Advance party (sent out by the support)
3. Support (sent out by the reserve)
4. Reserve

Patrols are sent out to the flanks by the advance party and the support proper. Additional



Note: An advance guard of company size has no reserve.

Figure 13-1.—A distribution for security of a battalion on the march.

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patrols are employed when necessary. See figure 13-1.

Contact between the elements of the advance guard is maintained from rear to front by radio and messengers, supplemented by visual and sound signals.

STRENGTH AND COMPOSITION.—The larger the command, the larger the advance guard. A large command takes relatively longer to prepare for action than a small one.

Units functioning as advance guards should have sufficient supporting weapons, such as automatic rifles, machine guns, and rocket launchers.

Table 13-1 will serve as a guide for the maximum size of advance guards and their elements for various organizations.

FORMATION AND DISTANCES.—To give the elements of the advance guard and the main body time and space to carry out their missions, they need to advance with distances between them. These distances are in addition to the road spaces each element occupies. None of these distances is set. They vary with the mission of the whole command; the size of the elements; the terrain; the proximity to, and the nature of, the enemy; and the visibility, such as daylight, darkness, or

weather conditions (fog, rain, snow). Distances should be less in rolling terrain where successive positions afford more protection than found in open, flat terrain. They should be less at night than in the day. They should be less when pursuing a beaten enemy than when approaching an unbeaten one.

THE POINT.—The point is a patrol sent forward by the advance party to give the rear elements warning of the presence of hostile forces. It reconnoiters to the front and immediate flanks and sends all the information it obtains to the rear.

The point confines its activities to the axis (length) of march and drives back all small hostile parties it meets. When large, hostile bodies of enemy troops are observed, the point pushes on until forced to halt by fire; when troops in the rear are halted by fire, the point covers their deployment. If such protection is unnecessary, acting as a patrol, it makes every effort to locate the enemy flanks and to determine the amount of the resistance. Different action may be required depending upon the mission of the command as a whole; that is, should reconnaissance be paramount, the point would be ordered to halt, conceal itself, observe, and send back information whenever hostile activities are seen.

Table 13-1.—Composition of Advanced Guards

Main body	Advance guard, total	Subdivision of advance guard			
		Reserve	Support	Advance party	Point
Battalion (less 1 company) . .	1 company	None . .	1 rifle company (less advance party).	1 platoon plus 1 section machine guns (less point) .	1 squad.
Company (less 1 platoon)	1 platoon plus 1 section machine guns.	None . .	None	1 platoon plus 1 section machine guns (less point).	1 squad.
Platoon (less 1 squad)	1 squad	None . .	None	None	1 squad.

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The point usually regulates its march on the advance party, one member being detailed to observe to the rear, to maintain distance, and to receive signals.

THE ADVANCE PARTY OF THE ADVANCE GUARD.—The advance party of the advance guard is sent forward by, and is the reconnoitering element of, the support. It is made strong enough to guard the support against surprise by hostile rifle fire. To accomplish this, it is required to do the following.

- Provide the point
- Support the action of the point
- Furnish patrols for reconnaissance and security to the flanks
- Drive back enemy patrols and take care of minor resistance that the point is unable to overcome
- Stop an enemy attack sufficiently to cover the deployment of the support

The advance party commander is usually responsible for the route of march and for the regulation of the rate of march for the entire column.

THE SUPPORT.—The support provides for its own security by sending an advance party forward and patrols to its flanks.

The support reinforces the action of its advance partly in dealing with minor resistance, or when it encounters the enemy in force, it offers sufficient resistance to permit the reserve to prepare for action following a definite plan.

The support commander gives definite instructions about what patrolling the advance party will do. He orders patrolling by the support that cannot be accomplished by the advance party. He stations himself where he can quickly see and estimate the situation when his unit is fired upon; usually, this position is with the advance party or between it and the support.

CONNECTING ELEMENTS.—Visual contact between elements of a column is maintained

by two or more units placed in the space between the elements. The units so designated are referred to as connecting groups (elements). Contact is usually maintained from rear to front. Therefore, whatever measures that may be required are furnished by the element in the rear to maintain contact with the element in the immediate front. They are spaced so each group can maintain constant visual contact with both the following and preceding file, group, or unit. When visibility is good, two connecting groups may be sufficient; in darkness or on roads with poor visibility, a larger number of troops is needed.

Connecting groups halt on orders or signals from the rear or when the point halts, relaying the signal to the front or rear.

Members of connecting groups look alternately to the rear and to the front for signals and move or halt as is necessary to maintain contact both to the front and rear.

REAR GUARD.—A force moving toward the enemy details a rear guard if attack or harassing action to its rear is possible. The size of such rear guards depends upon possible enemy capabilities.

The rear guard protects the main body from surprise, harassment, attack, or observation from the rear by hostile ground forces. Its mission and employment are similar to that of the advance guard except it is concerned with observation and action to the rear of the column. At no time should the rear guard attack the enemy. It must continue the march with the main body.

FLANK GUARD.—The flank guard protects a moving command from enemy ground observation and surprise action on the flank. If an attack in force occurs, the flank guard provides the necessary time and space for the deployment of the main body.

Flank guards may be employed in three ways.

1. Occupying a single flank position. If there is only a single avenue of hostile approach from a threatened flank, the flank guard occupies a position that covers the route. It remains in that position until the column has passed; then it joins the rear of the column.

2. Occupying a series of flank positions. When several dangerous localities must be passed

during the march, the flank guard may occupy several of these positions at once, moving forward in leapfrog fashion. As the tail of the column passes one danger spot, the element of the flank guard occupying that position may advance to the next unoccupied position to be blocked. This simultaneous occupation of a series of flank positions continues as long as the terrain and the situation demand. The flank guard reassembles after a prescribed location or at a specified time. It rejoins the main body as soon as practicable.

3. Moving parallel to the main body. When a route exists generally parallel to the line of march, and flank protection is required, the flank guard may march parallel to the main body. It may also be distributed in small or large detachments to resist an attack at various points along the flank of the main body or at least alert the main body of the presence of the enemy. Depending on the terrain and situation, the commander may employ an additional unit in conjunction with flank guards, if advisable.

THE BIVOUAC SITE

During a troop movement, you must make plans for a bivouac site in advance and take the following actions, even if you are only stopping overnight.

Before the arrival of the troops, a quartering party selects the bivouac site. This party usually consists of an officer in charge, two supply representatives, a medical representative, and a representative of each unit to be at the bivouac.

The selection of the bivouac site is governed by both military and sanitary considerations; however, tactical requirements always have priority over the other considerations. The main difference between an administrative and a tactical move is that security outposts are not normally required for an administrative move. Internal security (firewatch, personnel security, and perimeter guards) within the battalion area should be maintained for both types of moves. If the bivouac site has been previously designated by higher authority, a quartering party will precede the troops and prepare to establish the area for bivouac.

The tactical requirements that the quartering party should consider are as follows.

- Sufficient space for proper dispersal of the command
- Concealment from air and ground observation
- Protection against bombing or strafing attack
- Protection against mechanized attack

Desirable features for sanitation of the area and comfort of the troops are as follows.

- An ample supply of water for drinking, bathing, and washing clothes
- A grass-covered area of sandy, loam, or gravel soil
- An elevated site, well drained, but not a steep slope
- Shade trees in warm weather; hills as windbreaks in cold weather
- Accessibility to good roads
- A location removed from marshes, swamps, mosquito breeding areas, local native habitations, or any other unsanitary areas
- A site not occupied by other units within the preceding 2 months

When the bivouac site has been selected, the following provisions should be made before the arrival of the troops:

1. Select definite areas within the bivouac site for each unit (platoon or company).
2. Make a reconnaissance to determine the number of outguards necessary for security of the bivouac.
3. Mark unit areas and post necessary guides.
4. Select galley sites near the road for ease of supply, but far enough from the road so dust will not hinder cleanliness. Galleys should be as close

to a water supply as possible and have adequate drainage.

5. Establish the head on the opposite side of the bivouac and downgrade from the galley.

After the arrival of the troops, the following security measures are taken.

- Establish the necessary outposts, outguards, and patrols.

- Establish interior guard. Guard posts should be established immediately at the commissary dump, at the water supply, and in the unit areas. This is necessary to see that the water supply is correctly used, food is not damaged or stolen, and sanitary discipline is maintained. In addition to the security measures, routine tasks require assigning details for the following tasks.

1. Dig the heads
2. Set up the galley
3. Dig the kitchen pits (one for dry garbage and trash that can be burned, and one for wet garbage which must be covered daily)
4. Set up the sick bay and headquarters tents
5. Procure fuel, water, and other supplies

Troops not assigned to any of the above details will pitch tents and trench them immediately.

These assignments should be made before the arrival of the troops. This will prevent delay and confusion once the site has been reached. See figure 13-2 for a sample bivouac site.

TYPES OF OUTPOSTS (TACTICAL SITUATION)

There are two basic types of outposts: general and combat. An outpost is a security detachment distributed at some distance from the main body of troops during a halt, in camp or bivouac, or in battle position. Its purpose is to protect friendly forces from observation and surprise by the enemy.

Enemy capabilities, terrain, and the location of the main body determine the location and nature of the outpost.

The strength and composition of an outpost vary with the distance, mobility, armament, and attitude of the enemy; the terrain; the time of day;

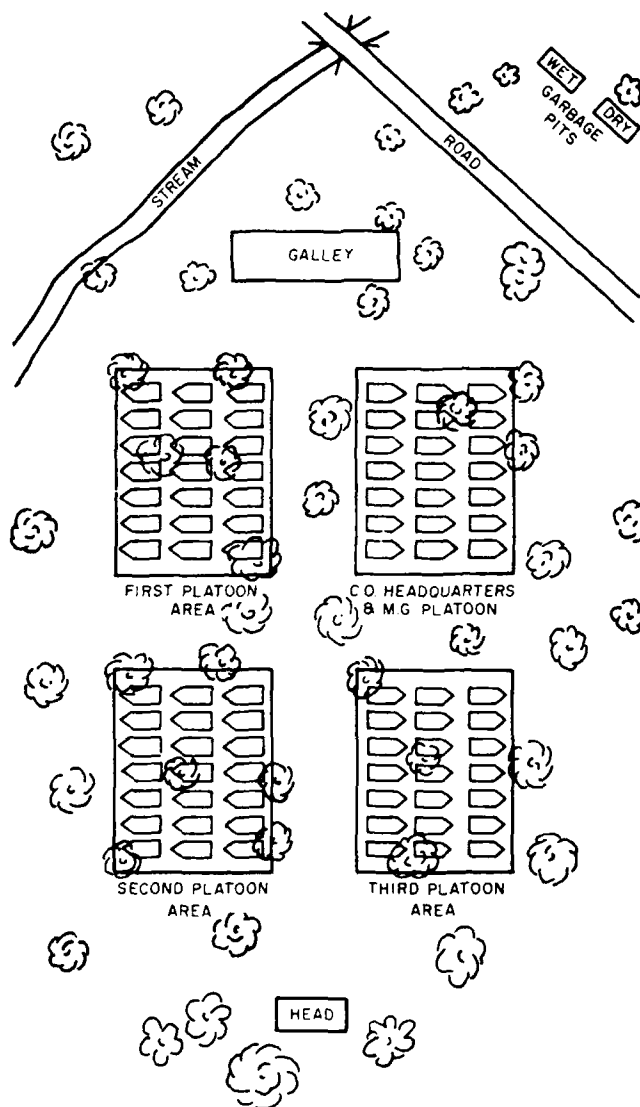


Figure 13-2.—Sample of bivouac site.

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the size of command to be secured; the degree of resistance desired; and the special tasks assigned.

As a SEABEE, you should be able to serve as a perimeter guard at outposts. Since the primary mission of an outpost is security, all personnel assigned to this duty should perform their assigned duties in the best possible manner. The safety of the entire unit could be affected by how well this type of duty is carried out.

The mission of an outpost is carried out by

1. reconnaissance,
2. observing and reporting information relating to the activity of the enemy,
3. preventing the enemy from gaining information,
4. giving warning of a hostile attack,
5. deceiving the enemy as to the location of the main body or the battle position, and
6. developing the enemy dispositions and delaying the hostile attack to allow the commander of the force to prepare for combat.

General Outposts

A general outpost normally consists of larger forces than are available to a battalion; therefore, general outposts normally play no part in a battalion's combat operations. The following explanation is given for information only.

The mission of the general outpost is to delay and *disorganize the advance of the enemy* and to deceive him about the true location of the battle position.

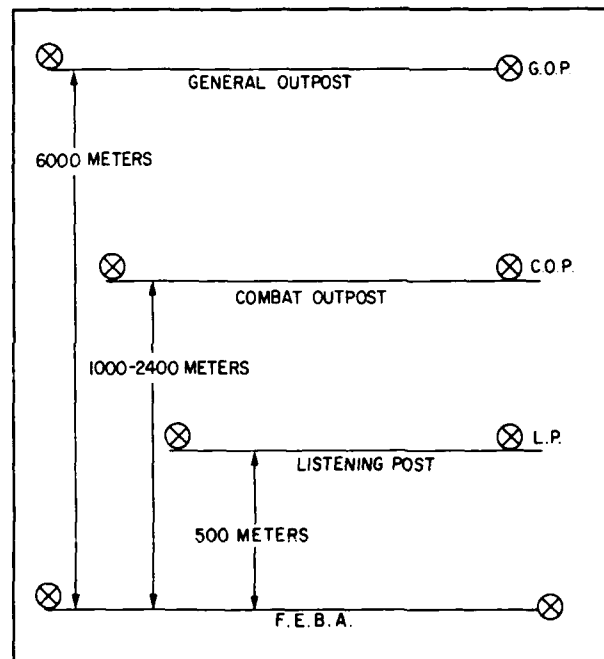
The general outpost consists of security elements, a line of support, and a reserve. The security elements may consist of patrols, detached posts, sentinels, and outguards. The support is the principal echelon of resistance of the outpost. The general outpost is usually established from 2000 to 6000 meters forward of the main body.

Combat Outposts

The type of outpost that you, as a member of an NMCB would man, is a combat outpost that covers the foreground of the battle position (fig. 13-3). It is normally established by the battalion and is the foremost element of the command.

The primary mission of the combat outpost is listed below.

1. To provide early warning and information of the advance of the enemy
2. To provide a counter-reconnaissance screen
3. To deny the enemy close ground observation of the battle area



187.178

Figure 13-3.—Outposts (schematic).

Within its capabilities, the combat outpost delays and disorganizes the enemy and attempts to deceive him as to the true location of the battle area. It does not engage in close combat. The combat outpost provides target information for the fire support elements.

The battalion commander normally prescribes the general location, strength, and composition of the combat outpost. It is usually established from 1000 to 2400 meters forward of the main body. Personnel to man the combat outpost are normally drawn from the reserve company or

from the frontline units, depending upon the requirements and the tactical situation.

The commander who normally establishes them controls the combat outposts and coordinates their actions with his own and adjacent units.

The general line selected for the combat outposts should afford long-range observation. It should be far enough forward to deny the enemy close ground observation of the battle position.

The combat outposts are usually organized in one echelon as a series of outguards (OGs) with sentinels and patrols. They maintain contact with security forces to the front (if any) and flanks and with the battle position (fig. 13-3).

Elements of a Combat Outpost

If the outposts are established less than 1000 meters from the battle position, the battalion commander may order frontline companies to outpost their respective fronts. The combat outposts for each battalion vary in size. They may range from a platoon to a rifle company reinforced with supporting arms.

The outguard of a combat outpost varies in strength from four men to a platoon, depending on its location and the number of sentinels it is to furnish. Outguards must be ready for action at all times. Although their primary mission is observation, they will normally fire on small hostile reconnoitering groups.

Sentries to observe to the front of an outpost position are furnished by the outguards. These sentries have the mission of discovering hostile activity, giving the alarm if an attack occurs, and carrying out other orders specifically prescribed

for their posts. Sentries are generally posted in pairs.

Outposts conduct reconnaissance within the limits required by their security mission. Patrols execute reconnaissance in advance of the line of sentinels and in areas not covered by sentinels. Patrols also maintain contact between elements of the outposts. Patrolling in front of the line of observation is increased at night or during periods of low visibility. Night patrolling requires systematic organization, careful preparation, and coordination.

RELIEF

The outpost personnel of a small command are usually relieved daily. Those of a large force may remain on duty for several days because new troops might not have time to organize and become familiar with the terrain and situation before being engaged in combat. Personnel at the outposts should be withdrawn before engaging the enemy in close combat.

Local Security

Local security provided by forward companies consists of observation posts, patrols, and listening posts. Security elements operate within small arms supporting distances of units on the FEBA on the nearest terrain features allowing observation of the company front. A security post consists of from two to four members. At night, listening posts, supplemented by patrols, are established on likely avenues of enemy approach.

As the enemy approaches, the security elements observe to determine enemy strength, actions, and routes of approach, then give a warning. They avoid combat and withdraw to the battle area as the enemy closes.

CHAPTER 14

DEFENSIVE COMBAT

The SEABEES' primary mission is construction in support of combat units. The objective of this chapter is to point out that the SEABEES' secondary mission is to defend the area they work in. In defensive combat, the mission of a Naval Mobile Construction Battalion (NMCB) is to repel or destroy the enemy by fire; to engage in close combat (bayonets) when fire by weapons fails; and to organize and carry out a counterattack if the first two methods fail to repel or destroy the enemy. Therefore, SEABEES must be trained in the same type of combat tactics that the Army infantry or the Marines receive, but the emphasis is on DEFENSIVE TACTICS, not offensive tactics.

You, as a SEABEE, should know all the steps taken by the battalion commander and the other leaders to protect the area you are assigned to. You should also have the answers to what, when, where, why, and how things are being taken care of. Then you should be in a better position to do your job with more confidence in your battalion's ability to hold the position it is defending.

The employment of the battalion in carrying out the defensive mission will vary with the construction mission, the size of the battalion, and the terrain to be defended. Many things affect the defensive mission of a battalion, such as how the platoons and the companies are organized and deployed; how they are maneuvered; and how you, as a member of a platoon and a company, assist in the defensive operations by following standing orders or standard operating procedures (SOPs) previously established or issued by the battalion commander.

Because operating principles vary, battalion commanders must remain flexible. They must gear the actions of their units to the organization and actions of higher commands or to the units or

commands with which they are working. They must be prepared to operate in a security role, a forward defensive area, or in a reserve role. They must coordinate their actions with the commands they are under or working with, or both.

PRINCIPLES OF WAR

The battalion commander may employ the principles of war, modified for the defense. Some of these principles that have particular application in the defense are described next.

THE OBJECTIVE

The objective of offensive forces is to control and occupy new territory. The objective of defensive forces is to hold on to the ground the NMCB already occupies, or could readily occupy without difficulty, and to keep it clear of the enemy.

SURPRISE

To achieve surprise, you try to hit the enemy forces without their knowing when, where, or how you are going to hit them; without their knowing what strength you have; and without their knowing what type of troops or tactics you will use. When used, surprise can decisively shift the balance of combat power. In the defense, it may be achieved by deception; effective combat intelligence and counter-intelligence; variation in tactics and methods of operation; and correct use of the unexpected, particularly in the counterattack.

SECURITY

The commander provides security for the defense by using all available information on the mission to set up the best plans possible to defend his area. But in establishing security, he should provide for flexibility in his actions and counteractions. Security should NOT imply undue caution and avoidance of all risks, because to be successful in war requires bold action.

UNITY OF COMMAND

Unity of command is carried out in the military by its chain of command. The senior unit commander is in charge (battalion CO), and his authority extends down through command channels to the individual SEABEE.

MASS

In this principle of war, the most superior combat power is assembled at the most critical time and place to make a decisive, positive decision in a battle. This principle does NOT imply that a greater mass of troops is involved, because combat power is primarily a combination of firepower and maneuver. Violation of this principle could cause the battalion to be defeated piecemeal by an inferior enemy.

TYPE OF DEFENSE

The type of defense that is most often used in a SEABEE battalion is the area defense, also known as the position defense and the perimeter defense. The primary mission of an NMCB normally is to build a facility; the secondary mission is to defend it. Outside help is not expected for the defense of the facility. As an independent unit, the best way for an NMCB to protect a facility is to use area defense.

An area defense is oriented toward holding specific terrain, such as a facility the NMCB constructs. In this type of defense, forward positions are strongly held; emphasis is placed upon stopping the enemy forward of the forward edge of the battle area (FEBA). Therefore, the bulk of the combat power is committed in the forward defense area. If the enemy penetrates this

area, he should be destroyed or ejected by counterattack. The SEABEES' principal objective is to regain control of the forward defense area they have captured.

AREAS OF DEFENSE (THE ECHELONS OF DEFENSE)

Defensive echelons include the security area, the forward defense area, and the reserve area (fig. 14-1). The battalion battle area is the defensive area organized by a single battalion. It includes all that area inside the outer perimeter of the battalion. Throughout this section, when reference is made to the battle area, it means the battalion battle area unless otherwise indicated.

Security Area

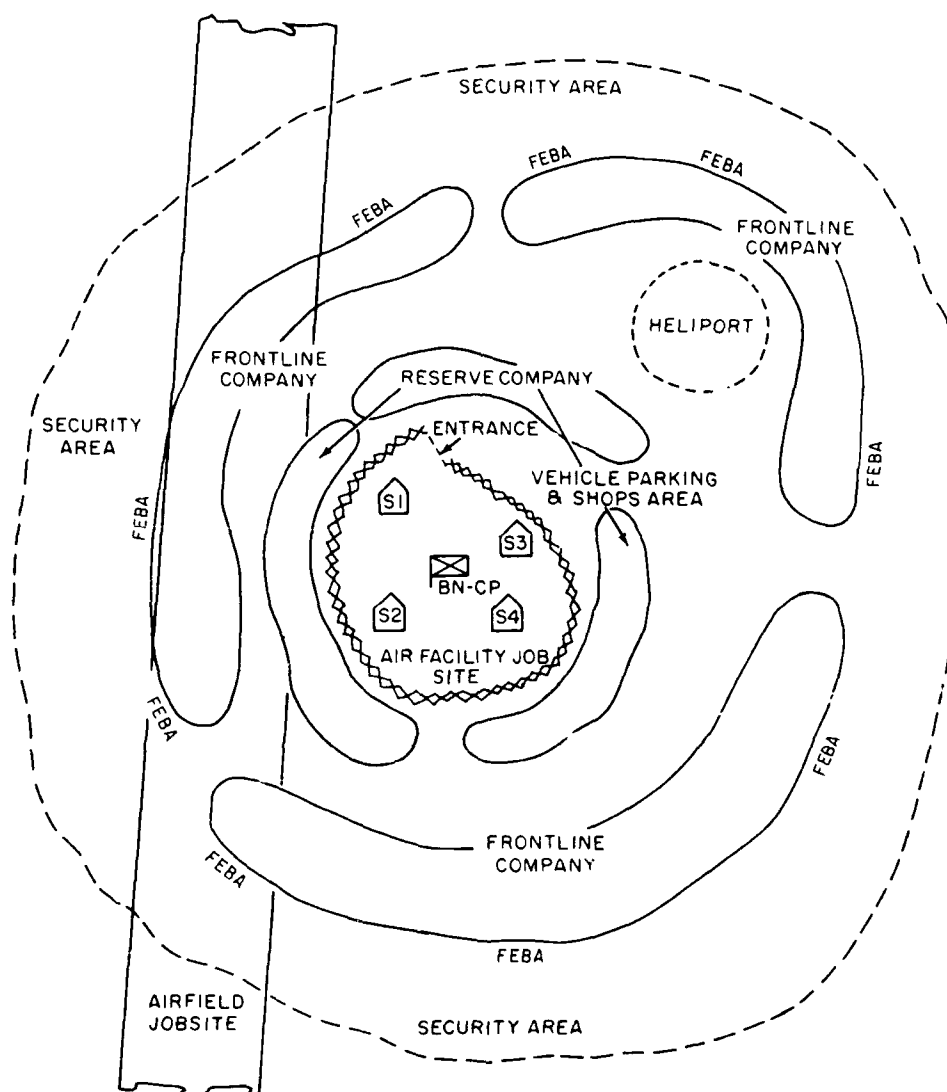
The battalion security area extends from the FEBA to the location of the front security elements available to the battalion. Forces in the security area, combat outposts, and listening posts furnish timely information about the enemy to battalion headquarters; deny him close ground observation of the battle area; and deceive, delay, and disorganize him as much as possible. Security forces in this area may include aerial surveillance, listening posts, combat outposts, patrols, and local security elements.

Forward Defense Area

The battalion forward defense area extends rearward from the FEBA to include that area organized by the forward companies. Forward defense forces engage the enemy in decisive combat forward of the FEBA to prevent any penetration of the battle area.

Reserve Area

The battalion reserve area extends from the rear of the forward companies to the center of the battalion battle area. Forces in the battalion reserve area are used to eliminate penetrations and block or reinforce threatened areas. They should be able to destroy or eject the enemy by counterattacking to regain control of the battalion's forward defense areas, if needed.



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Figure 14-1.—Battalion Forward Defense Area.

THE DEFENSIVE ORGANIZATION

The area defense includes three tactical groupings: the security force, the holding force, and the reserve force, which will be explained further under "Planning The Defense." The commander of the NMCB formulates his plans for the area defense on the following principles: organization of the critical terrain, depth, mutual support, all-around defense,

coordinated fire plans, antitank defense plans, and flexibility.

Security Force

The security force consists of personnel from the holding force (companies on the FEBA) and/or reserve force. The size of the force depends on the terrain, the weather, and the size of the area to be defended. It consists of the

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listening posts, the combat outposts, and the patrols sent out by the battalion commander.

Holding Force

The holding force consists of the troops from a company or companies of an NMCB that are expected to bear the main effort of the enemy.

Reserve Force

The reserve force should be strong enough to be used in a counterattack or to bolster an area where the enemy appears to be putting his maximum effort. The minimum strength of this force is probably a platoon; the maximum strength, a company. Terrain, weather, and the size of the area to be defended must be considered before the strength of the reserve force is determined. The reserve force should NOT be a collection place for the sick, lame, or lazy. It should be an organized company of platoons and/or squads ready to perform an assigned mission (counterattack and so on).

PLANNING THE DEFENSE

Intelligence is the focal point in the first stages of defense planning. It should include information about the probable strength, composition, direction, and time of the enemy attack. The SEABEES usually get this information from the intelligence that nearby Army, Marine Corps, or Air Force units share with them.

In planning his defense, the battalion commander ensures that adequate provision is made for the all-around security of his defense force. Note, also, that the defending force has several advantages and disadvantages.

Advantages of the Defense Force

The defending force usually has or can gain the following advantages:

1. Terrain favorable for the defense
2. Better control and coordination of effort
3. Maximum effective use of firepower through careful organization of the defense

4. Added protection by the use of field fortifications

5. Fewer personnel and material losses as a result of the preceding advantages

Disadvantages of the Defense Force

The following disadvantages often counterbalance the advantages of the defending force.

1. The attacker has the initiative; he can decide when, how, and where the attack will occur and in what strength the attack will be mounted.

2. Because the attacker has the initiative, the defender may have to spread his forces rather thin to defend all possible avenues of approach by the enemy. The attacker, on the other hand, can mass his force at one decisive point.

The basic tool used by the battalion commander in planning the defense is the maneuver plan, which will be covered later in great detail. Used in support or in coordination with the maneuver plan are seven other basic plans, or systems: the barrier plan, deception plan, fire support plan, communication plan, counter-attack plan, alternate action plan, and logistic plan. These plans will be discussed later under "Plans Used in Support of the Defense and Maneuver Plan."

Maneuver Plan

This plan is part of the planning required for the defense. Throughout the development of the maneuver plan, the commander must consider the mission, the enemy; the terrain and weather, the troops available (known as METT), and the effect of each on the overall plan of defense. The assigned maneuver elements of the NMCB are the rifle companies, which can be maneuvered (moved) as the battalion commander sees fit. The maneuver plan shows the movement and placement of the assigned and attached maneuver units that will carry out the mission.

In developing the maneuver plan, the battalion commander and his staff normally follow a logical

planning sequence similar to the following guidelines:

1. Analyze the mission and all other available information pertaining to the mission (weather, terrain, and so forth).

2. Determine the key terrain and major avenues of approach by the enemy into his sector.

3. Determine the tentative forces to be employed on the FEBA (holding force) and to be in the reserve (reserve force).

4. Determine the security forces and measures required to ensure security of his forces.

5. Establish any requirements for making obstacles, antitank defense, and other defensive measures (deception plan if needed).

6. Establish the control measures required, such as the positions to be assigned all units; this includes the frontages and depths of defense to be assigned, the communication requirements, and any special security requirements.

7. Finalize organization of forces for combat.

8. Determine administrative support requirements.

9. Consider alternate plans for all foreseeable contingencies.

The above steps are flexible. They may be adjusted to fit the operational situation, type of operation, or the personality of the commander. He may consider some of the steps in a different order or at the same time and revise some as he carries out the planning.

ANALYSIS OF THE MISSION.—The first step the battalion commander makes in developing a maneuver plan is to analyze the battalion's mission thoroughly. He reviews all available information on the weather, terrain, and friendly and enemy forces that could affect the mission. The battalion commander must study his orders to ensure that he understands all tasks, stated or implied, that the battalion must accomplish.

KEY TERRAIN FEATURES AND THE AVENUES OF APPROACH.—Part of the second step the commander takes in developing the maneuver plan is to determine the key terrain features. The commander should perform a detailed reconnaissance of the area by foot, air,

or motor vehicle as soon as time permits. The commander analyzes his personal observation of the area, possible fields of fire, concealment, cover, and any natural obstacles in the sector before deciding what he needs. Based upon this reconnaissance and other information obtained, he analyzes his defensive sector to determine terrain features that must be controlled to accomplish his mission. If the seizure or control of such a feature would be a marked advantage to the enemy, it is a key terrain feature—one that must be controlled by the defender. The defender is not rigidly bound to physically occupy key terrain features; he may control entry to them or, with supporting fire, defend them with comparatively small forces. At times though, defending key terrain features in strength may be necessary. The commander may also designate key terrain features to be part of his plan of maneuver. While determining the key terrain features, the commander considers all possible avenues of approach into his area from any direction. He also considers possible avenues of approach to be used by elements of his force in the counterattack. Both considerations are part of the second step in developing the maneuver plan.

TENTATIVE FORCES TO BE EMPLOYED ON THE FEBA.—The battalion commander usually makes up a tentative organization of the forces to be used in the defense early in his maneuver plan (third step). However, as he continues to develop his maneuver plan, he may adjust this allocation of combat power (forces and weapons).

When analyzing the terrain, the commander considers the amount of resistance that may be needed at the entrance of each major avenue of approach. He then bases his decision on what may be required to hold the terrain or to delay the enemy. One technique the commander may use is to visualize the number of platoon-sized units required on the FEBA.

A battalion commander is limited by the size of his battalion, assuming no supporting troops are available. Therefore, the number of companies or units he can employ along the FEBA for security and still maintain a reserve is limited. Depending on the size of the area to be defended, the width of the sector (area) assigned to each company or platoon usually varies. The

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commander must ensure that he assigns an adequate reserve, and he must do this without weakening his primary fighting organization on the FEBA. The size of this force is his decision to make, and he bases the decision on all the information he has available.

SECURITY FORCE.—The size of the security force is determined by the type of mission; the size of the anticipated enemy forces; the actual terrain; the weather conditions; and equally important, the number of troops available (METT) and the actual size of the frontline units. Therefore, the actual size of the battalion commander's security force may vary with each mission. The battalion commander begins to see the total security force (fourth step in developing the maneuver plan) emerge when he establishes local security for each company and platoon; the battalion's combat outposts and listening posts; the flank and rear position security forces; and the reserve force. Any other security measures that might be needed are based on this area security force; for example, patrols.

OBSTACLES AND OTHER DEFENSE MEASURES.—Once the commander decides which areas the enemy may penetrate, he assigns blocking positions to the specific locations. The forces assigned to these positions then prepare and occupy the areas unless plans are made for future occupation by the reserve force. The commander considers the size, the trafficability (road network available), and the natural defensive strength of the area to be defended. He also considers the enemy's capabilities and the capabilities of the defenders (fifth step in developing the maneuver plan). The commander considers possible improvement of the natural obstacles and the use of man-made barriers to improve his defense. From this analysis of his defensive area, he determines how he can best use the terrain to accomplish his mission with available resources (troops and weapons).

CONTROL MEASURES.—The control measures established by the battalion commander (sixth step in developing the maneuver plan) include frontages and depths assigned to individual units. They also include other measures, such as the communication system,

road networks used, fire support, coordination with other units, patrols sent out, supply point, and evacuation point.

For control, the battalion commander usually designates the FEBA and the initial location of the combat outposts when they are used. He also designates the responsibility of the company or companies along the FEBA by specifying the location of their company boundaries and mutual support areas. The responsibility for holding critical defensive areas is NEVER split between SEABEE units (battalion, companies, platoons, squads, or fire teams).

FINALIZING ORGANIZATION FOR COMBAT.—To finalize his organization for combat (seventh step in developing the maneuver plan), the battalion commander must accumulate, analyze, sort, and use a massive amount of information. Then, and only then, can he determine his combat organization of the FEBA and select tentative lateral boundaries. The commander may tailor his assigned or attached companies by employing them separately or with any other size unit(s).

ADMINISTRATIVE SUPPORT REQUIREMENTS.—In determining his administrative support requirements (eighth step in developing the maneuver plan), the battalion commander must consider replenishment of ammunition, food, water, personnel, weapons, and so on. The amount, type, and method of delivery (land, air, or sea) depend on the tactical situation.

ALTERNATE PLANS.—In addition to the primary positions established for the defense, the commander may be required to establish alternate positions and supplementary positions. These positions may be required as part of the battalion commander's alternate plan of action, the last step in developing the maneuver plan. Secondary (alternate) positions may also be established in cases when the battalion may fall back to regroup. Prior planning is of the utmost importance to carry off successfully such an operation. A counterattack plan should be part of this alternate plan.

Also, to maintain continuity in the defense or to retain a sufficient reserve for a later decisive action, the commander may desire to withdraw

portions of the front-line units. An action of this type requires strong personal leadership by all the commanders concerned, careful prior planning, and well-trained troops. A unit entrusted with the defense of a tactical locality never abandons it unless ordered to do so by higher authority.

MISSION OF THE DEFENSIVE TACTICAL GROUPS

The breakdown of the three tactical groups used in position defense, as mentioned under the "Defensive Organization," is the security force, the holding force, and the reserve force. These forces are formed and organized after all the above actions have been completed.

Security Force

The security force usually consists of the local security elements sent out from the companies on the FEBA, the battalion's combat outposts and listening posts, and the local security elements for protection of the rear and flanks. All these positions are manned either by frontline or reserve company personnel. The battalion's combat outposts and listening posts are located 1000 to 2400 meters forward of the FEBA. The listening posts are located in the foremost position to give advance warning of the enemy's presence. The mission of the listening posts is to gain information about the enemy and to prevent surprise attacks on the holding forces. They do NOT engage in combat unless no other choice remains. The mission of the combat outposts is to delay and disorganize the enemy, to deceive the enemy about the actual location of the FEBA, and to inflict casualties. Combat patrols can be used to gather enemy intelligence by capturing prisoners, engaging in firefights to test the enemy's strength, and observing his position. All security forces should be withdrawn to the FEBA before the enemy can organize a full-fledged assault and overrun their positions. The security force normally tries not to become decisively engaged, but will fight to delay the enemy. If security forces do become engaged, they will inflict the most casualties possible on the enemy.

Unless deception and surprise are an essential element of the defense, the attacking enemy is normally taken under long-range fire as early as

possible. As the enemy advances, he is taken under increasingly heavier fire. Before a security element is forced to withdraw through friendly elements to its rear, it delays, deceives, and disorganizes the enemy to the maximum extent possible.

Certain measures are taken against possible enemy airborne, guerrilla, and infiltrating forces so that the unit can concentrate on its primary mission. A warning system that uses security and observation elements already in place is established throughout the battalion area. Detailed reconnaissance is conducted to locate probable drop zones (parachutists) and landing zones that the enemy could use. When necessary, special patrols, warning devices, roadblocks, and observation posts with ground radar equipment (if obtainable from nearby Army or Air Force units) may be established to cover these zones. Measures should be taken to provide security of administrative elements in the area. An illumination plan to light the area (use of flares or other artificial means) should be prepared. When information indicates that the enemy force has entered the defense area, all or a portion of the reserve is given the mission of destroying it. Preplanned fires should be established to support the reserve. Other units within the area remain in position and support the reserve by fire.

Holding Force

The battalion commander assigns his holding force to frontages and depths of the battlefield area where the enemy is likely to confront his troops. He assigns frontages and depths in proportion to available manpower and the importance of the areas to be defended to his forward companies. If either the frontage or the depth were too small, his troops would be jammed together. This would allow for a single mortar or artillery round to inflict heavy casualties.

A SEABEE battalion is capable of conducting a defense on ideal terrain (good fields of fire, visibility, and so forth) with two companies. The two companies are positioned on line over frontages up to 3000 meters and depths of about 2500 meters. However, three line companies are normally used on the FEBA with one line company kept in reserve. Companies are capable of conducting a defense on ideal terrain over

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frontages up to 1500 meters and depths of 1100 meters. These are considered to be the maximum frontages and depths; the actual frontage will normally be considerably less. Conditions that limit the visibility and the fields of fire of the defender will always reduce this maximum frontage. Those that offer good avenues of approach to the enemy or that reduce the combat power of the defender will also reduce the maximum frontage. The actual capability of the battalion in any given situation can only be determined after a complete estimate of the situation.

When the battalion has a frontage in excess of 4500 meters, it will still occupy only 4500 meters or less of its defensive sector. In effect, this will result in gaps between companies that must be covered by any available means. Patrols, combat outposts, supporting fire, observation posts, listening posts, and minefields (Claymore) are some of the means used to cover gaps. An enemy attack through these gaps must be detected, located, and fired on. If the need arises, the enemy attack must also be blocked and/or destroyed by the fire and maneuver of all or part of the battalion.

Units should be located and employed so that they can assist one another with direct fire of their automatic weapons. As a minimum, mutual support is obtained between companies by the defensive firing of 81-mm mortars.

Care must be exercised to ensure a proper balance between concentration and dispersion. Dispersed personnel and equipment at every echelon must be capable of carrying out the mission. The depth of the area assigned to the forward companies is comparatively shallow in relation to the overall depth of the battalion area. However, they are given adequate space to position their weapons, fire control point or points, and logistical elements, and to establish alternate and supplementary positions. The forward defense forces that are part of the holding force make up the strongest part of the defense. They man the position on which the enemy concentrates its main efforts. The battle position is composed of subordinate positions, each organized for all-around defense and disposed in width and depth. The subordinate positions are mutually supporting.

The mission of the forward defense forces (part of the holding force) is to stop the enemy by fire, to repel him by close combat (bayonet) if he breaches the line, and to eject him by counterattack if he penetrates the line. The company commander does this by locating weapons and assigning fire missions to do the following:

1. Support the withdrawal of security forces
2. Fire on targets of opportunity as the enemy approaches the FEBA
3. Ensure that the heaviest fires fall immediately forward of the FEBA (called FINAL PROTECTIVE fires, they should be mutually supporting, interlocking bands of grazing fire)
4. Limit penetrations to the FEBA by supporting fire from weapons placed in depth, either the company's weapons or the battalion's weapons platoon
5. Support the counterattack in case of enemy penetration

Reserve Force

While the battalion commander is determining the size of the holding forces required on the FEBA, he should also be considering the size and location of his reserve force. He should allocate sufficient combat power to the reserve after thoroughly considering METT. The reserve should not consist just of those who remain after the other elements are assigned to the FEBA. Appropriate missions for the battalion reserve include the following:

1. Providing personnel for the battalion portion of the combat outpost
2. Preparing and occupying blocking positions
3. Conducting counterattacks
4. Assisting forward companies, when practicable, by the use of assigned fire support
5. Providing flank and rear area security
6. Preparing to assume the mission of a forward company when ordered

The reserve positions and the alternate and supplementary positions are selected so that they provide defense in depth, all-around defense, and flexibility. Where possible, positions should be on

or near key terrain features or on major avenues of approach where penetrations can be blocked.

Defense in depth provides adequate depth to stop the enemy from breaking completely through your lines before the reserves can be brought into action to repel or destroy the enemy. All-around defense implies that although your unit is normally organized to repel an attack from one direction; it should be just as capable, as well as prepared, to do the same thing if the attack is from any direction. Flexibility is providing plans (use of reserves in a counterattack) to gain the initiative if an attacker shows any weakness.

When the battalion commander requires the reserve to prepare alternate or supplementary positions, he specifies the priority of construction. When the battalion reserve is not working on positions, manning the combat outpost, or performing surveillance missions in the battalion rear area, it is usually occupying the reserve positions having the highest priority for defense. These positions may be completely occupied or occupied with skeleton forces; the remainder of the reserve may be dispersed in the vicinity.

The reserve must be prepared to move quickly to threatened areas. Transportation may be used to shift reserves rapidly. Vehicles provide a capability to concentrate power rapidly from dispersed positions to participate in a counterattack.

Reserve units organize in-depth defensive positions behind the FEBA, but within the battle position. Their primary missions are to support the companies on line by defensive fire, to contain any penetration of the FEBA, and to repel or destroy any enemy who breaches the FEBA. Battalion reserves may be held mobile, in covered and concealed positions, they must be ready to counterattack or occupy previously prepared positions when the need arises.

If the enemy penetrates the battle area, the battalion commander uses his reserve to contain the penetration. When the opportunity comes, he orders a counterattack to restore the battle area and to destroy enemy forces in the area of penetration. The decision to counterattack is made by the battalion commander. In making his

decision, he considers, if necessary, the following questions:

1. Has the enemy been slowed or stopped forward of the positions of the battalion reserve?
2. Has all available defensive fire been employed without destroying the enemy?
3. Are reserves and supporting fires adequate to support the counterattack?
4. Has terrain been lost or threatened that jeopardizes accomplishing the mission?
5. Is a counterattack practical when obstacles that may result from nuclear fires in the area are considered?
6. Are the physical condition and morale of his troops such that a counterattack would probably succeed?

Based on his thoughts to the preceding questions, the battalion commander determines the probability of success. Affirmative answers to these questions generally favor a counterattack. However, they need not all be affirmative. The commander's estimate of success is the decisive factor; a study of these questions is not a substitute for an estimate. As an example, suppose the defender is strongly supported and has an adequate reserve; then stopping or slowing the enemy forward of the reserve positions need not be the controlling factor in the battalion commander's decision.

The counterattack capability is neither wasted against minor enemy success nor employed against overwhelming odds. When it is launched, the counterattack is given all possible resources to ensure accomplishing the mission. Piecemeal commitment of the counterattacking force jeopardizes the success of the entire operation. The counterattack is, therefore, carried out rapidly and aggressively, and employs all the combat power necessary to ensure success. After a successful counterattack, the battalion commander modifies his defensive plan. If the counterattack fails, further orders must be issued.

PLANS USED IN SUPPORT OF THE DEFENSE

For the defense to be successful, other plans used in coordination with the maneuver plan must either be put into operation or made known to

the troops. These plans are listed alphabetically, not by their importance, as follows:

- Alternate action plan
- Barrier plan
- Counterattack plan
- Communication plan
- Deception plan
- Fire support plan
- Logistic plan

Alternate Action Plan

Although the battalion commander tries to plan for all foreseeable contingencies, he still should make alternate action plans. He should also plan for additional positions to ensure flexibility in his defense plan. Also, he can obtain flexibility by maintaining a reserve and by centralizing the control of fire support at the battalion level. Counterattack plans are prepared with the knowledge that they frequently may have to be adjusted to meet a different set of circumstances than originally envisioned.

Barrier Plan

As part of his barrier plan, the battalion commander plans for use of obstacles forward of and within his defensive area. He must exercise care in planning the barrier system to avoid interfering with the rapid shifting of the defending units. Before obstacles are constructed, the location of defensive positions and the effect of barriers on the mobility of friendly forces, particularly in the counterattack, are considered. Forward elements can prepare, set up, control, and fire exploding flame devices and flares to create obstacles. Natural obstacles are used to the maximum; the demands on manpower, material, equipment, and time limit the use of man-made barrier constructions.

Obstacles are used to block easy approaches by the enemy into the defensive position. They are also used to keep him under flanking fire (fire into the side of advancing troops) and flat-trajectory fire (line-of-sight fire). Obstacles channel the enemy's attack into killing areas where the use of the reserve is most effective. Barrier

systems and minefields are the principal types of obstacles. Wire entanglements should be laid out so that their outer edges can be covered by flanking fire. Other obstacles must be coordinated with demolitions. To be effective, obstacles are covered by fire to hinder their removal and breaching. They should be concealed, whenever possible, to increase their surprise effect on the enemy. Minefields are used to strengthen natural obstacles, cover likely avenues of enemy approach, and to protect exposed flanks. Barrier and denial plans are coordinated with adjacent units. These plans must conform with the plans of senior levels of command.

Counterattack Plan

One of the last steps the battalion commander takes in planning for the defense is making counterattack plans. These plans are prepared at the same time as the plans for the defense. They are prepared for all areas, within the defensive area, where enemy penetrations are likely. At the battalion level, a counterattack is a limited objective attack. It is designed to repel or destroy the enemy within a penetrated area and to regain lost portions of the battle area. The battalion reserve normally provides the maneuvering force; but the counterattack plan provides for including any other assigned, supporting, or attached units. The weapons of the battalion support the maneuvering force, including, where practicable, weapons of the forward companies. Normally, a single, coordinated effort is delivered as the situation and terrain dictate. This effort avoids passage through friendly troops to the fullest extent practicable. All friendly elements within the penetrated area are attached to the commander of the maneuvering force.

When the battalion commander prepares counterattack plans, he gives priority to those plans that assume the loss of or threat to the most critical terrain. The commander of the reserve force often carries out the detailed planning for the counterattack. Plans are rehearsed as much as time and security permit. Every effort is made to ensure that a reconnaissance and rehearsals are conducted as required.

A counterattack plan has the usual features of any attack plan; however, the battalion commander must give special thought to the

following: If not notified by his unit commanders, the NMCB commander must estimate the size of the force in the penetration and its width and depth. He then must determine the capabilities of his forces to block and eliminate the penetration. The maneuvering force is usually assigned to defend a terrain feature within the penetration area. The objective of the force is to help eliminate the penetration and restore the battle area to the defender's advantage.

The commander must also determine the direction in which the attacking friendly force should hit the enemy. The direction of attack should permit unity of effort and provide the necessary close control of the attacking friendly forces. Normally, the attack is directed at the flank or base (rear) of the enemy penetration. The plan provides for attacking forces to enter as few friendly defensive areas as possible. This helps to avoid confusion of the friendly troops.

The commander must also designate line of departure, which is the location from which the reserves start their attack; however, its location is NOT firm. This location may be modified later to suit the situation at the time of the attack. The commander must also consider the time required to deliver fires in support of the counterattack and to move the counterattacking force to the line of departure.

An attack position, a staging area, or a jumping-off point must also be designated. But they may not be used unless they are essential for controlling the attack, since unnecessary massing of troops and delay may result.

Communication Plan (System)

To control the defense, the commander must plan and ensure an adequate communication plan or system. The communication system ties together higher, lower, adjacent, attached, and supporting units. All means, including radio, wire (field telephone), messenger, visual, and sound, are used to the maximum extent practicable.

In the defense, wire is the principal means of communication. When adequate wire communication is available, radio is not used. However, radio nets remain open since wire communication may be interrupted or may be inadequate for the situation. The use of radio is normally restricted except during periods of

enemy contact. Flares and other visual signals may also be used in the defense. These signals can be used to identify friendly units, to call for lifting and shifting supporting fires, and to signal for the execution of counterattack plans. Communication trenches must be located, as much as possible, where they are concealed from the enemy and do not disclose the positions of combat emplacements.

The wire communication system within the battle area should be reviewed and built up, if needed. The platoons should have lateral wire communications between platoons. Direct lines should connect the company command posts (CPs) to their squads and connect company CPs to the battalion CP. Direct lines should be used in addition to lateral wire communications between companies. When and where time permits, alternate routes should be laid to all units. These lines would help ensure that a source of wire communication would exist except under the most adverse conditions. The backup methods of communication (radio, messengers, flares, or visual) should be planned for, established, and their method of execution defined.

Deception Plan

In developing his plan of defense, the battalion commander considers the use of deception measures that may cause an attacker to waste his effort. The security force employs deception to cause the enemy to deploy his forces too early and delay the execution of his plans. Dummy positions and equipment and simulated activities may increase the economy of force (minimum use of his troops). They may also cause the enemy to execute unnecessary offensive action and make his force vulnerable to counteraction.

Dummy fortifications mislead the enemy and disperse his fire. Surprise may be achieved by substituting real weapons for dummies in positions that have been discovered by the enemy.

Fire Support Plan

Throughout the development of the defensive plan of maneuver, the battalion commander concurrently develops a fire support plan. The purpose of fire support is maximum destruction

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of the enemy. This plan includes the support of security forces of the FEBA and the reserve.

Final protective fires are planned forward of the battle area to break up the enemy assault. Final protective fires include direct fires and the allocated barrages of any supporting artillery and mortars. The battalion commander uses barrages to cover dangerous avenues of approach into the battle area. He designates the general location of each barrage. The forward rifle company commander in whose area the barrage is located specifies its exact location on the ground to his forward observer. The forward observer reports its exact location to the fire direction center (FDC). The rifle company commander assigns the location of barrages for the company to cover approaches not covered by the barrages from battalion. The company commander also assigns the location of those needed to extend the coverage of these barrages.

The fire support plan at any echelon consists of the coordination of fire available to that echelon with the fire plans of the subordinate echelons. Systematic flanking fire by frontline automatic weapons, supplemented by the fires of available supporting arms, makes up the basis for defensive dispositions. Thus, the fire plans of units on the FEBA are the basis of the entire fire plan.

The assigned fire of any echelon is seldom as adequate as is desired. When possible, support from the next higher echelon or available support weapons or both make up for deficiencies in fire. In the defense, the barrier plan (including demolitions), location of defensive positions, counterattack plans, and the conduct of the defense are coordinated with the fire support plan. This coordination allows the defense to anticipate the development of prime targets, to fire on targets before they disperse, and to speed up procedures to use fire support.

Logistic Plan

Although the battalion commander is primarily responsible for the practice of supply

discipline within his command, he does have an S4 (supply officer) to manage this function for him.

The logistics plan is written by the battalion S-4 (supply officer). He designates the battalion logistics, which are divided into combat and field logistics when the battalion is committed. The combat logistics contains the combat service support elements of the battalion. The exact composition varies with the tactical situation; however, it normally includes class III (fuels and lubricants) and class IV (augmented materials) distribution points and the battalion aid station. If the vehicular movement is light, the quantity of class III supply is small. When class IV materials resupply is required, it is done by a supply point or unit distribution.

The battalion logistics is normally located 1 to 2 miles to the rear of the FEBA.

The field logistics consists of those elements not in combat logistics. For example, the remaining class III and IV supplies, the supply section, and the mess section are located in the field logistics. The field logistics originates and sends supplies forward and organizes maintenance support. The mess section is normally responsible for resupply of water, as well as for feeding the battalion.

ON-POSITION DEFENSE PREPARATION

At the same time as the commander and staff are preparing the plan of defense, physical movements or actions are being taken within the battalion. These actions prepare the battalion units (elements) for their defensive mission, either on position or from where their defense is to be conducted.

When the defending units arrive on position, they immediately begin organizing their defensive position. Many of the tasks involved are carried on at the same time, but some may require priority. The battalion commander may specify the sequence for the preparation of the position and any special preparations to be

taken about camouflage. The following is a recommended sequence:

1. Establishing security
2. Positioning weapons
3. Clearing fields of fire; removing objects; making observation of, and determining ranges to, probable target locations
4. Providing signal communication and observation systems
5. Laying minefields and preparing important demolitions
6. Preparing weapon emplacements and individual positions to include overhead cover and camouflage
7. Preparing obstacles (other than minefields) and less vital demolitions
8. Preparing routes for movement and for supply and evacuation
9. Preparing alternate and supplementary positions
10. *Preparing chemical, biological, and radiological (CBR) protective shelters as required*
11. Preparing deceptive installations by following any deception plans of higher headquarters

In preparing for the defense, the battalion commander should use three integrated efforts: organization of the ground, organization of supporting fire, and completion of the tactical organization.

Organization of the Ground

The first step in organizing the defense for combat is the organization of the ground. It begins as soon as the troops arrive in the area to be defended and continues as long as the position is occupied. When the ground must be organized while the force is in close contact with the enemy, defense against attack may be required during any and all stages of the organization. Maximum use is made of available supporting fire to cover the organization of the ground. Smoke may be used to prevent the enemy from observing the preparation.

In the organization of the ground for the defense, measures for increasing the effectiveness of fire take precedence over field fortifications. Therefore, fields of fire are cleared as the first step; that is, the areas that will be fired over are determined. Then any obstacles located there are removed. You should note that the entire company does NOT clear fields of fire. Only half of each platoon take part in clearing the fields of fire. The other half provide security on the FEBA. After this is completed, the construction and improvement of individual cover, defensive works and obstacles, and routes of approach for supplies and reserves are planned. The construction field fortifications are limited only by the time and means available.

Troops and weapons should have the best possible protection. Field fortifications should be constructed or located so that they cover all avenues of enemy approach. When possible, they are protected by barbed wire entanglements. These protective entanglements are placed parallel to and along the friendly side of the final protective line. Their purpose is to prevent surprise assaults from points close to the defense area. This protective barbed wire entanglement should surround each individual, company-sized unit of the command. Connecting individual protective entanglements to those around other companies encloses the entire defensive position. The total protective barbed wire entanglement includes those installed over the tops of emplacements provided with overhead cover. Chapter 9 covered the use of barbed wire and special-type bunkers.

Alternate and supplementary positions should be prepared following the established system of priority. Construction should never cease; the improvement of a position should continue as long as the position is occupied. The routes of communication (movement) throughout the position should be continuously improved to ease movement of supplies and personnel. They should also be built where needed to ease the functions of observation and command.

The battalion commander's primary consideration in selecting the defensive position and assigning the force within it is that the position must be one that the enemy must attack; that is, a location the enemy cannot bypass without serious threat to his flank or rear. The defender,

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at every echelon, must take advantage of each opportunity to regain the initiative. Such an opportunity frequently occurs when an enemy attack is repulsed; after he has seized an objective, but is not yet organized to defend it; or when he is already closely engaged elsewhere.

Organization of Fires (Including Supporting Fire)

The second step in organizing the defense for combat is the organization of the fire (including support fire). The battalion commander must ensure that all the battalion's defensive frontage is covered by fire. Lateral companies, as well as lateral platoons, must have interlocking fires where their boundaries meet. The support weapons available to the battalion commander of an NMCB are the weapons platoons (machine gun) from each company, and the 81-mm mortar platoon from headquarters company.

In the organization of support fire, machine guns and other supporting weapons sections are normally placed within a platoon's defense area to carry out fire missions assigned by the company commander. Their location allows the battalion commander to control them centrally. Because the rifleman is responsible for protecting such weapons, these emplacements will influence the rifle platoon's defensive organization to a great extent; therefore, they should be put in position early.

The Tactical Organization

The third and last step in organizing for the defense in combat is completing the tactical organization of the battle area. The battalion commander assigns defense areas to his forward rifle companies. In turn, the company commanders assign defense areas to their rifle platoons.

The **FRONTAGE** assigned to a rifle platoon on the FEBA (in open terrain with good fields of fire) should normally not exceed 500 meters. In

wooded or brush-covered terrain where fields of fire are poor, the frontage assigned should not exceed 300 meters. One unit should cover a critical terrain feature or avenue of approach into the company defense area. Never split this responsibility. The assigned area of a platoon should definitely include responsibility for at least one of the critical features or avenues of approach.

The depth of the platoon defense area may extend from 50 to 200 meters. All this cannot be physically occupied by troops; therefore, only the most critical portions are assigned as positions for the squads. The remainder is defended by fire. A forward rifle platoon defense area is shown in figure 14-2.

COMPANY IN DEFENSE

Immediately upon assuming the mission of defense, the company commander usually goes to a designated central location in the battalion defense area to receive the battalion commander's defense order. But if his company is already in contact with the enemy, he should not be ordered away from his troops. However, the company commander's company may be waiting in an assembly area to the rear or moving up to the defense area when he receives his detailed instructions or orders.

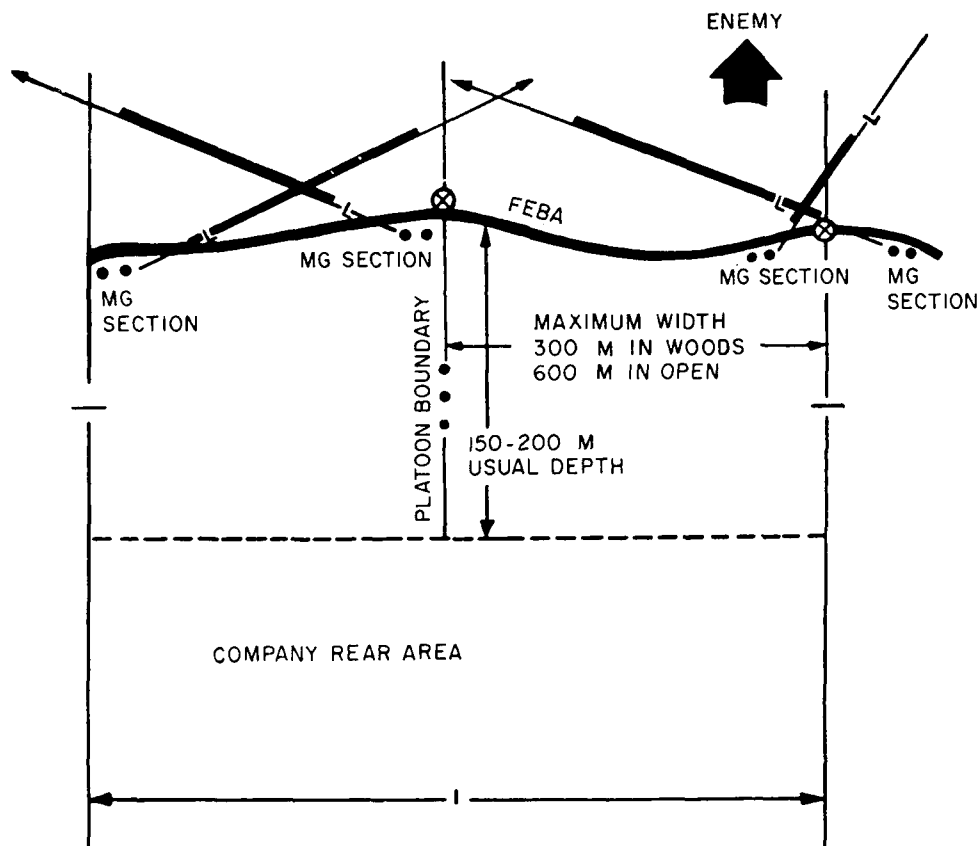
Company Headquarters Management

The assistant company commander normally supervises the movement, security, internal administration, organization, and operation of the company headquarters. He also allocates shelter for troops in the headquarters area.

The troop leading steps of the company commander are the same as those described for platoon commander (discussed earlier in chapter 12).

Fire Plan

The company commander should prepare the company fire plan, including the fires of



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Figure 14-2.—Forward rifle platoon defense area.

all company weapons. After the company commander assigns the mission and the locations of the heavy weapons, he formulates the company plan. It is built around and integrated with the plan for heavy weapons, both on the FEBA and in depth.

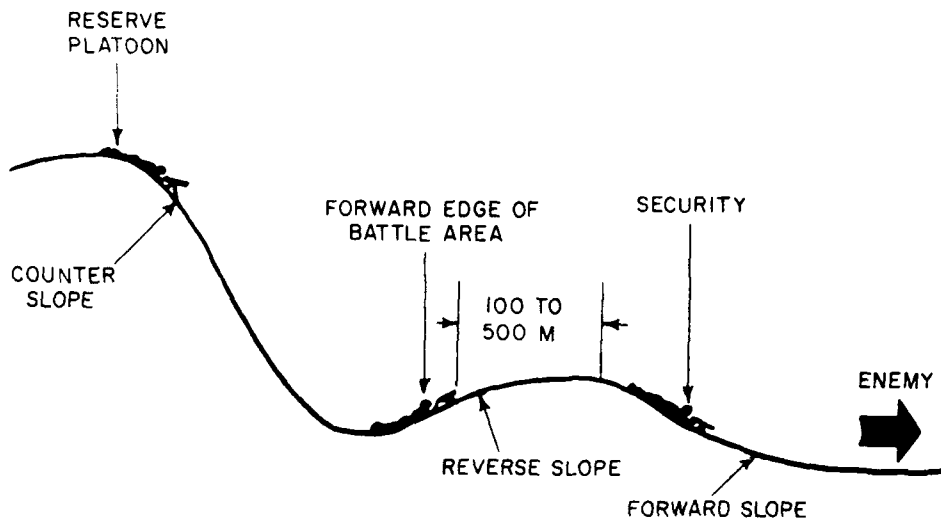
Boundaries are completely established including company-sized tactical localities. Such localities include hills, woods, draws, or any other key features or concealed and covered approaches into the battalion defense area. Responsibility for such areas must never be split between two company commanders.

When the enemy has advanced to 500 meters from the FEBA, the company commander will direct his riflemen and machine gunners to fire

on targets of opportunity. However, guns that are to cover the final protective line should not fire at this time.

Types of Positions to be Occupied

The types of combat positions used in the defense are the primary, alternate, and supplementary. The names given to these positions are based on their mission or use. The **PRIMARY FIRING POSITION** assigned to a unit or individual weapon is the one from which the most important part of the mission can be accomplished. Troops in this position will normally receive the full force of the enemy's attack; they are tasked with the mission of



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Figure 14-3.—Defense of a reverse slope.

repelling or destroying him. An **ALTERNATE POSITION** is assigned in the event the primary position becomes untenable and withdrawal to the alternate position appears to be advisable to keep the defender from being overrun. This withdrawal is done only upon receipt of the battalion commander's order to do so. A **SUPPLEMENTARY POSITION** is a position from which targets can be fired upon that cannot be engaged from the primary or alternate positions (targets located on the flanks).

Positions classified according to the contour of the ground are forward slope, reverse slope, and counterslope positions. **FORWARD SLOPE** positions are located on forward or toward-the-enemy slopes; they usually afford the best observations and fields of fire. **REVERSE SLOPE** positions are located on the reverse slope or the side away from the enemy; they usually offer the best cover and concealment. Such positions should NOT be located more than 500 meters (about the maximum effective rifle-fire range) nor less than 100 meters from the crest.

COUNTERSLOPE POSITIONS are located on the forward slope of the next elevation to the rear of, and are used with,

a reverse slope defense (figure 14-3). Such a position is normally used by the reserve of a unit manning the forward reserve slope.

Selections of Positions

The company commander indicates the general positions to be occupied by the forward rifle platoons. These positions include portions of the FEBA indicated by battalion. For instance, the company commander might order a platoon to occupy the forward slope of a hill, within the platoon defense area, across which he wants the FEBA to run.

The first criterion in the selection of a position is whether the mission can be carried out and future operations made easier by the use of the position. However, SEABEES are normally defending sites or installations constructed by them; therefore, the defense may be required to be set up on terrain that is not the most suitable for the defender. Seldom will a position be found that satisfies all the requirements of the defending force.

Within the limitations of the mission, the best possible position is selected that increases the defender's capabilities and decreases those of the enemy. Thus, a defender with a relatively heavy-armored capability chooses a position where armor can be used; a defender opposed by an enemy with heavier armored capability chooses terrain suited for a good defense against armor.

The defending commander seeks terrain with maximum natural defense strength. He selects positions that give him control or possession of as many of the following terrain factors as possible:

1. Key or critical terrain
2. Observation and fields of fire over enemy avenues of approach
3. Cover and concealment
4. Natural obstacles that will impede the enemy's advance
5. Avenues of approach

Of these five factors, the most important one is observation and fields of fire. The troops should be moved into the positions they will be defending as soon as possible. The longer they have to prepare their positions, the more they can improve their position and strengthen the overall defensive situation. Constant supervision should be maintained to ensure that all individuals put their maximum effort into improving their positions. With seasoned troops, well aware of the enemy situation, this is NOT as important as it is with unseasoned troops. Seasoned troops ensure that they have the best protection time will allow.

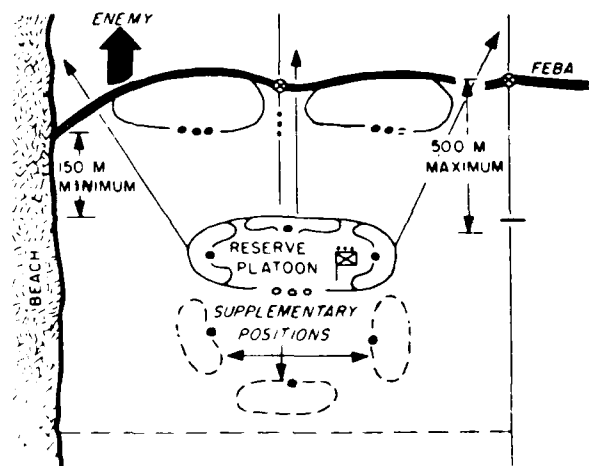
Reserve Platoon

The company commander usually places two rifle platoons on the FEBA and the third platoon in a depth position. The position for the reserve

platoon should be at least 150 meters from the nearest elements of the forward platoons, but not more than 500 meters from the FEBA, as shown in figure 14-4. In this situation the reserve platoon is outside the zone of enemy fire falling on the FEBA, but within effective small arms range. The reserve platoon is not included in the areas of the forward platoons. The position selected may be a key terrain feature from which the reserve platoon can carry out its mission. Also the platoon may be split into squads separately defending particular terrain features or blocking individual avenues of approach.

Supply

An additional problem of the company commander is supply and evacuation. Preliminary planning must include enough on-position ammunition, food, water, and other necessities to see the company through any sort of attack within the enemy's capabilities. Resupply and evacuation planning before the enemy attacks will save the commander a great deal of effort at a time when tactical direction requires most of his attention. This subject is covered next under "Logistics."



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Figure 14-4.—Reserve platoon in defense.

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Logistics

The company commander is responsible for the practice of proper supply discipline within his command. The principal supply personnel within the company include those petty officers who supervise the logistical functions of supply and maintenance. Normally the assistant company commander is the company supply officer. All officers and petty officers of the company share in the responsibility for the proper use and safeguarding of supplies and equipment.

The company commander and all supply personnel should be familiar with pertinent orders and directives about company supply. Essentially, the commander should know what supply and equipment he is authorized; what he has on hand and how to safeguard it; what he needs and how to procure what he does not have.

Losses of major items of equipment should be reported immediately to the battalion supply so that measures to replace these items can be initiated.

COMPANY LOGISTICS is organized to provide immediate logistical and administrative support to the company. This support consists of the company's supply, maintenance, administrative personnel, and attached medical personnel. Only the vehicles, supplies, and equipment necessary to provide immediate support should be located within the company's logistical area.

The company commander selects the location for the company logistics. The logistics location should ease supplying the platoons, be at or near good road nets or trails, be easily identified, and provide cover and concealment.

Supply items found within the company logistics may include POL (petroleum, oils, and lubricants), clothing and equipment, and part of the company's basic load of ammunition.

FOOD and **WATER** are provided by the battalion mess section, the part of the support platoon that provides messing facilities for the company. The section can be split, if necessary,

so that it can support any company conducting an independent or semi-independent operation.

The procedures for feeding will differ, depending upon the situation. Normally, the battalion S4 (supply officer) prepares a feeding plan based upon information furnished him by the companies. As a minimum, the company commander should advise the battalion S4 of the number of personnel to be fed, the time of feeding, the location(s) where the food should be delivered, and the type of ration desired if other than normal.

Every attempt should be made to feed personnel hot meals whenever practical. When this cannot be done, individual rations will be issued to personnel for their own preparation.

Water is usually delivered with the food. When units cannot obtain drinking water from utility sources, local water is purified, as needed, in either Lister bags or individual canteens.

CLOTHING and **EQUIPMENT** authorized items should be in the hands of the company when it enters combat. The company commander (or his representative) informally requests replacement of these items from the battalion support supply section by either telephone or message. He must submit requests to replace equipment destroyed by enemy action immediately. When an item becomes unserviceable, the company should use the correct SOP (standard operating procedures) established by the battalion to replace it.

Class IV items consist of those items of equipment that the company requires over and above those authorized by appropriate publications. Such items include fortification materials, additional weapons or equipment for a particular type of operation, and special equipment for varied climates. Requests for such items are processed through command channels. When the need no longer exists for these items, they are returned to the battalion.

FUEL and **LUBRICANTS** requirements of the company are submitted daily as an informal

estimate of the class III needs to the battalion S4. The preferred procedure for supplying class III items is by unit distribution in which the battalion refuels the company in the company area. When this is not feasible, the company may have to send vehicles back to the battalion logistic area for refueling.

AMMUNITION resupply is the responsibility of the supply petty officer who coordinates the resupply of ammunition for the company. As ammunition is expended, the rifle platoons notify the supply petty officer who, in turn, resupplies ammunition to the platoon areas. If he is unable to use company vehicles because of the terrain or enemy situation, the ammunition is delivered by platoon carrying parties.

As ammunition at the company supply is expended, the supply petty officer frees a vehicle by redistributing its load among other vehicles. He gives the driver of the vehicle an informal request that shows the amounts and types of ammunition needed. The driver presents the request at the battalion combat logistics. The loaded vehicle then returns to the company supply.

Ammunition may be requested in excess of the authorized basic load of expected expenditures if the excess is intended for immediate use. For example, additional ammunition for preparatory fires may be drawn and issued to the firing unit. When additional ammunition is not fired as expected, this fact is reported to the battalion. Within the companies, ammunition is distributed under the supervision of the platoon commanders by the platoon guide.

THE RIFLE PLATOON IN DEFENSE

Up to this point, we have been primarily telling you what the battalion or company commanders are required to do in planning for, in preparing for, and in carrying out the defense. Now let us cover the rifle platoon in defense.

Within the area designated by the company commander, the platoon commander selects the

most tactically sound positions for his squads. The platoon commander's positioning of his squads determines the exact line of the FEBA. His choice must agree as nearly as possible to the FEBA designated by the company commander. For instance, if the company commander indicated the forward slope of a hill, the platoon commander may not set up his defense on the reverse slope.

In selecting his squad's positions, the platoon commander will be concerned primarily with the mission of supporting other units; stopping the enemy by fire in front of the FEBA; and repelling him by close combat if he breaches the defense area. The enemy situation, friendly situation, and nature of the terrain have been considered by higher commanders before the platoon commander is ordered into position. He also must thoroughly evaluate the five terrain factors listed below. These factors help determine where to place his squads in the strongest positions possible to carry out the platoon's mission.

1. Key or critical terrain features
2. Observation and fields of fire
3. Cover and concealment
4. Obstacles
5. Avenues of approach

The platoon commander and the other company officers usually receive the defense order at the company CP. However, the platoon commander should not be called back from his platoon if his platoon is already in contact with the enemy. After he receives the defense order, he will then begin leading the troops in the defense.

In a fast-moving situation, the steps used in leading troops, discussed earlier, may be curtailed for lack of time; but they should be used if time allows.

Distribution of Squads

Usually, when defending an area, a platoon accomplishes its mission best with all its squads

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abreast, facing the expected direction of attack. This enables the platoon to readily place all its firepower at once in front of the FEBA. A squad is not normally kept in reserve for missions, such as an addition to position depth, limiting penetration, protecting flanks and rear, and local counterattacking. Usually, these missions require a unit with more combat power than a squad has. The platoon, with its squads abreast, is able to cover its front, the intervals on its flanks, and also mutually support adjacent platoons. Figure 14-5 shows the fire distribution of a squad on line.

When the platoon is filling a narrow gap between adjacent flank platoons, the squad can be placed abreast without echeloning the flank squads rearward (fig. 14-6, view A). If the gap is wide, however, the flank squads must be bent back to gain mutual support between platoons.

Each squad is assigned a sector of fire that overlaps that of adjacent squads (including, for flank squads, the squads of adjacent platoons).

When only two squads are required to cover the platoon's front by fire because of a narrow frontage and a suitable depth position for the third squad exists, then one squad may be placed in the in-depth position. This squad must, however, be able to bring its fire to bear forward of the FEBA (fig. 14-6, view C).

NOTE: This squad is NOT in reserve; it is providing in-depth support.

Supplementary Positions

A rifle platoon must be able to defend its area against attack from any direction; therefore, squad supplementary positions that allow the squad to fire to the flanks and rear are prepared in addition to its primary position(s). These positions should be located as close to the primary positions as the terrain permits (fig. 14-6, views A and B). The depth interval between the primary

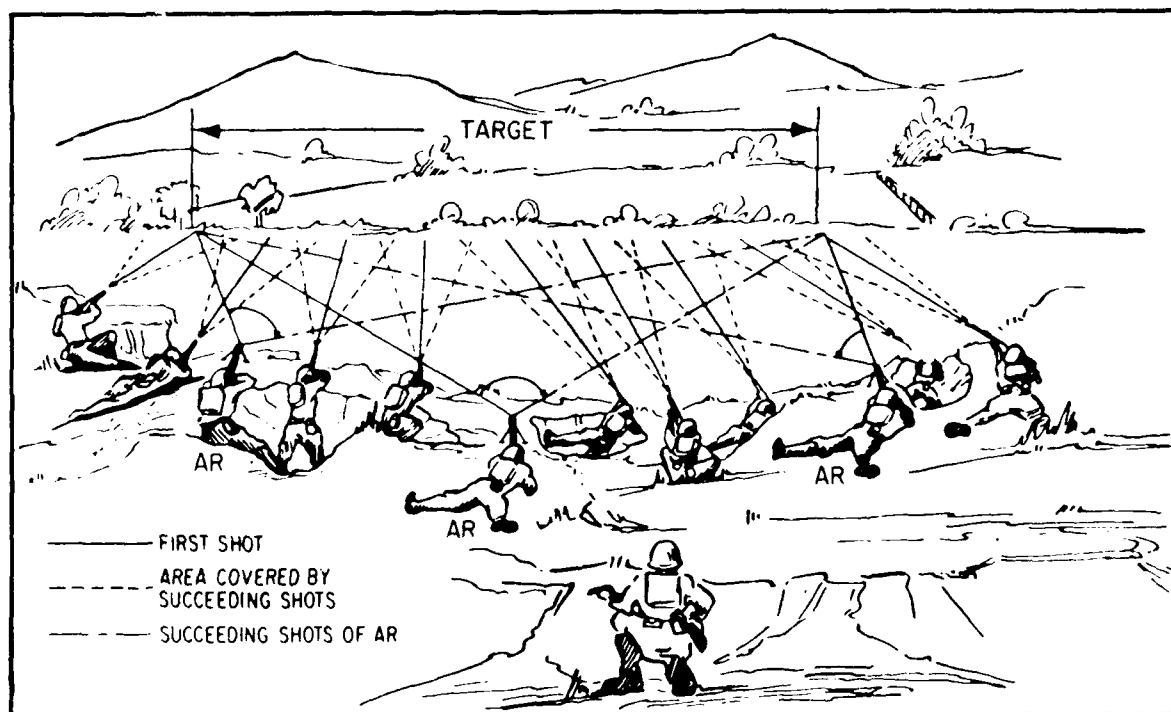
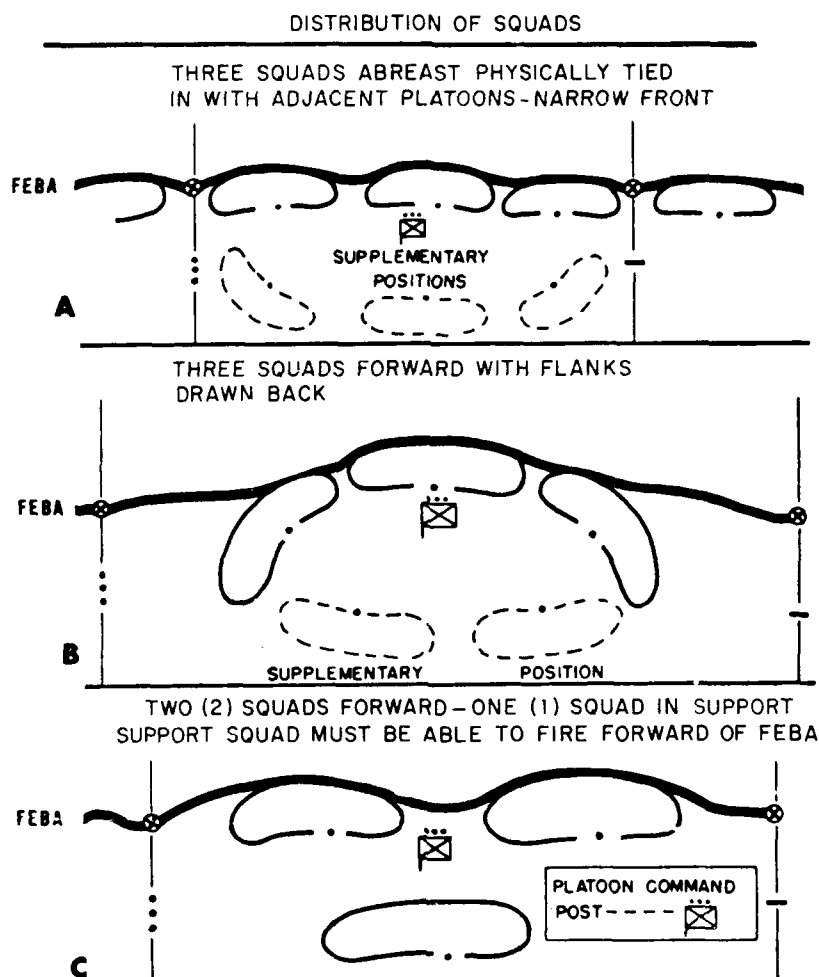


Figure 14-5.—Fire distribution by individuals of a rifle squad.

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Figure 14-6.—Platoon defense formations.

and supplementary positions determines the depth of the platoon area. This is normally 200 meters or less. In open, flat terrain, riflemen can shift their fire to the rear without changing position. In this case, supplementary positions are unnecessary. This is a desirable situation because a change of position during a fire fight is always dangerous. Therefore, supplementary positions are used only when their use is unavoidable. Natural cover, drainage ditches, and other covered routes should be used in moving to supplementary positions. If time permits, communication trenches should be prepared.

Alternate Positions

Each platoon should have alternate positions to fall back to when the enemy's strength is too great to hold the primary positions. Occupancy of alternate positions is done only upon battalion orders.

Platoon Observation/Command Post

For a base of operation, the platoon commander establishes an observation command post (OP/CP) where he can observe, as much as possible, the platoon's sector in front of the FEBA. The position should be dug in,

camouflaged, and provided with covered and concealed routes of approach from the rear.

The platoon commander keeps two runners at his OP/CP and sends one to the company CP. Quite often the terrain does not allow a position where the entire area can be observed and controlled. In this case the platoon CPO establishes another position where he can control part of the platoon. Of course, the platoon commander is not relieved of his responsibility for the entire platoon; he is merely aided in his observation and control.

In addition to the OP/CP, the platoon commander also chooses a covered and concealed position for a supply point. Supplies are brought to, and casualties evacuated from, this position under the direction of the platoon guide.

Security

The platoon commander is responsible for providing his own local security for his platoon's

position. The company commander will normally direct that outguards be established forward of the FEBA; but if no company security is provided or ordered, the platoon commander must establish his own. Outguards should be of fire team strength or less and are usually placed within 400 meters of the FEBA. Some individuals must also be kept continuously alert to observe for enemy ground and air action.

Squad Sectors of Fire

The platoon commander develops a fire plan for his platoon. This plan must cover by fire the entire platoon front immediately forward of the FEBA. He does this by assigning overlapping sectors of fire to his squads and sectors and primary directions of fire to his machine gunners, as shown in figure 14-7. The sectors of fire for a flank squad must include the interval between

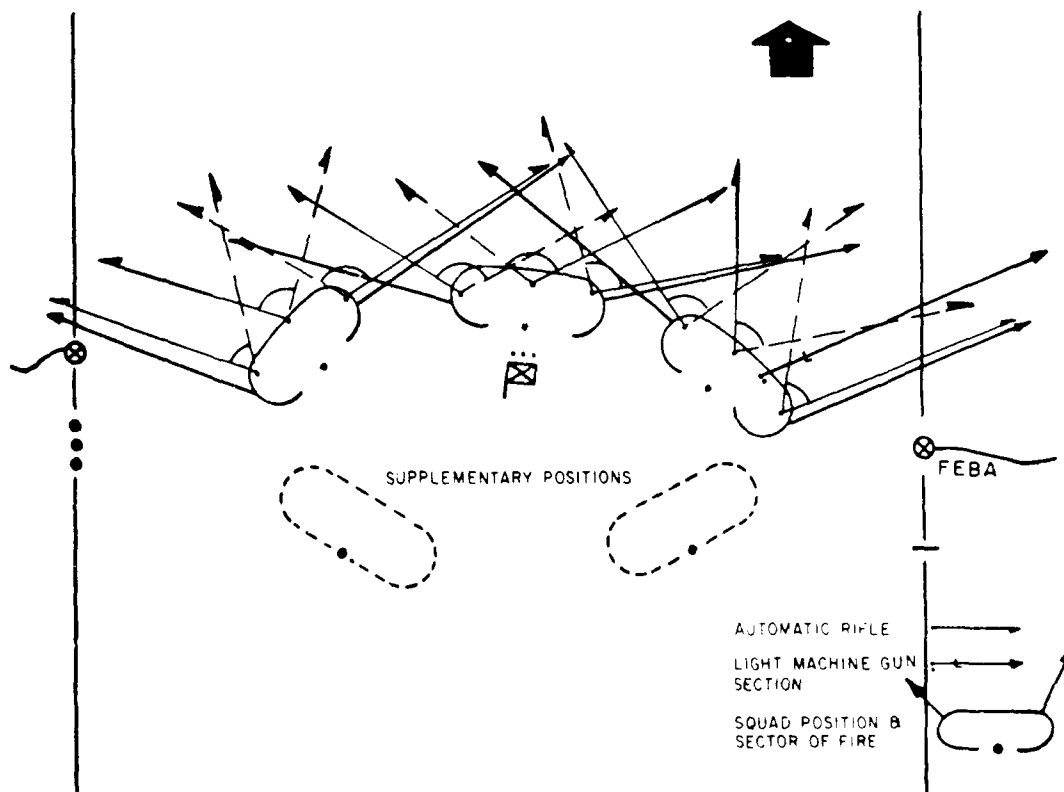


Figure 14-7.—Platoon defense fire plan.

the platoon's flank and that of an adjacent platoon.

Mutual Support

To the fullest extent possible, the platoon's fire should also be able to cover the fronts of adjacent platoons. This is a vital factor in mutual support. The platoon commander must ensure that his fire will intersect that of adjacent platoons forward of both platoon flanks.

Avenues of Approach

Possible avenues of approach by enemy infantry must be covered by fire—preferably machine gun fire. Such avenues include ditches, gullies, wooded draws, and any other covered and concealed approach.

Supporting Weapons

In organizing his fire, the platoon commander must ensure that all supporting weapons in his area are protected by the fire of his riflemen and machine gunners.

Organization of the Ground

The platoon organizes the ground according to the priority established by the company commander. In the order of their priority, the normal platoon tasks are as follows:

1. Clearing fields of fire
2. Digging fighting-holes
3. Constructing tactical and protective wire
4. Placing antipersonnel mines
5. Constructing obstacles
6. Camouflage

When time permits, the platoon should dig communication trenches.

Initial Enemy Contact

The first direct contact between a platoon on the FEBA and enemy ground forces occurs when the attacking enemy appears within 500 meters of the platoon position. The outposts will normally warn the platoon of the enemy's approach. The

platoon commander then notifies the company commander of the presence of the enemy, their direction of advance, armament, strength, and any other pertinent information he has obtained.

The final protective line is an imaginary line. If the enemy crosses this imaginary line, he will be attacked by machine gun and mortar fire. The platoon commander can call for final protective line fire only if authorized to do so. If he is not authorized, he must keep the company commander constantly advised on the development of the enemy attack. Because the firing of the final protective fire discloses the location of the entire FEBA, the final protective fire must not be used until the last possible minute, and then only when absolutely necessary. When the order (usually a signal flare) is given, the platoon commander makes sure his squads are covering their assigned sectors of fire. He makes sure that the machine guns are firing in their principal direction of fire, and in general, the platoon's fire plan is being carried out.

Close Combat

If the enemy succeeds in breaking through the final protective fire and reaches the FEBA, every man remains in his position to repel the enemy. Each one engages the enemy in close combat, using grenades, point-blank fire, and bayonets. Machine gunners may use a "free gun" during this part of the defense if they find it to their advantage. A free gun is one that can be fired in any direction. Enemy tanks are met with rifle-fired grenades, LAWs, and other available means. The battle position must be held at all costs.

Penetration in Adjacent Areas

Because of the heavy volume of fire that falls on a platoon's position during an enemy attack, movement within a platoon's position is often impractical. However, the enemy may penetrate the areas of adjacent or supporting platoons. In such cases, the platoon commander must move some of his men to previously prepared supplementary positions to protect his exposed flanks or rear.

Communications

For the platoon commander to take full advantage of the fire support and other help available from company and battalion, he must maintain constant communication with the company commander. He continually keeps the company commander informed about the progress of the enemy attack. He must ensure that he has wire communications to adjacent platoons.

THE WEAPONS PLATOON IN DEFENSE

Machine guns are the backbone of the defense. In coordination with the fire of other weapons, their fire is employed to stop the enemy regardless of the direction of his attack. The following characteristics, unique with the machine gun, are the basis of its value as a defensive weapon.

- Its large volume of fire can be readily applied.
- Its suitability for enfilade (flanking) fire because of its long, narrow beaten zone.
- It is easily concealed.
- The fixed mount enables effective fire during periods of restricted visibility.

The machine gun section functions as a fire unit under normal circumstances. Regardless of the nature of the mission, two guns (one section) are usually assigned to the same mission. Under some conditions, however, machine gun sections may be split. Such conditions would include an overly extended front, poor fields of fire, and the guns being placed in depth with reserve units.

Type of Missions

Machine guns employed throughout the defensive position normally have one or more of the following missions:

FINAL PROTECTIVE LINE FIRE.—If possible, the machine guns of frontline companies will be situated where they can fire interlocking bands of grazing fire across the front of the company (final protective line, FPL). These

guns provide a major portion of the final protective line fires.

Guns assigned a final protective line fire mission may also be assigned a sector of fire if the location of the firing position makes the assignment of a sector practicable.

CLOSE SUPPORT OF THE FEBA.—

Machine guns with this mission actually have two missions: covering possible avenues of enemy approach and limiting penetrations. However, adequate final protective line fires have priority over such missions.

When practical, some of the machine guns of a frontline company are placed behind the FEBA to cover probable avenues of enemy approach into the position. Such guns must be within the company defense area.

Machine guns assigned the close support mission should also have previously prepared supplementary positions from which they can stop (eliminate) limited penetrations into the FEBA by fire.

PROVIDE DEPTH.—Some machine guns of the reserve company are placed in depth within the battalion defense area to stop deep penetration by fire.

REINFORCE COMBAT OUTPOSTS.—

Reserve company machine guns are sometimes placed with units in the outpost system.

PROTECTION TO THE FLANKS AND TO THE REAR.—Protection of the flanks and the rear is of particular importance when there is an open flank. Machine guns in close support of the FEBA and those placed in depth to eliminate deep penetrations will normally be assigned supplementary positions where they can accomplish this mission.

SUPPORT COUNTERATTACKS.—In the event a penetration is effected by the enemy, the machine guns of the reserve company are the principal source of close support for that company's counterattack. After the counterattack, these guns are used to restore the fire plan in the penetrated area.

Selection of Positions

The primary consideration in the selection of firing positions for machine gun sections is accomplishing the mission. However, other factors must be considered. Cover and concealment of the gun and crew are essential if the gun is to remain in action, because automatic weapons are the primary target of enemy infantry. Intelligent use of natural terrain irregularities reduces the labor and time necessary to build emplacements.

Routes of ammunition supply to the gun positions should be carefully selected. An initial supply of ammunition will seldom cause a problem in a defensive situation. However, covered resupply routes of approach to gun positions will be necessary before the initial supply is used completely.

In most cases, fields of fire will have to be cleared. Only enough foliage to allow unobstructed fields of fire should be cut. Clearing all of the foliage, or more than is required, reveals your position to the enemy.

When a section is emplaced, the two guns should be at **LEAST 30 meters** apart to reduce the effectiveness of hostile mortar and artillery fire.

PLACEMENT OF GUNS.—The result of the placement of the machine guns, shown in figure 14-8, is the ability of at least one section to engage any enemy attack. If necessary, the company commander improves the machine gun fire plan by selecting new positions. This placement of machine guns and the assignment of final protective line fires are carried out as soon as practicable. The flanks and the entire company front are then covered by interlocking bands of grazing fire.

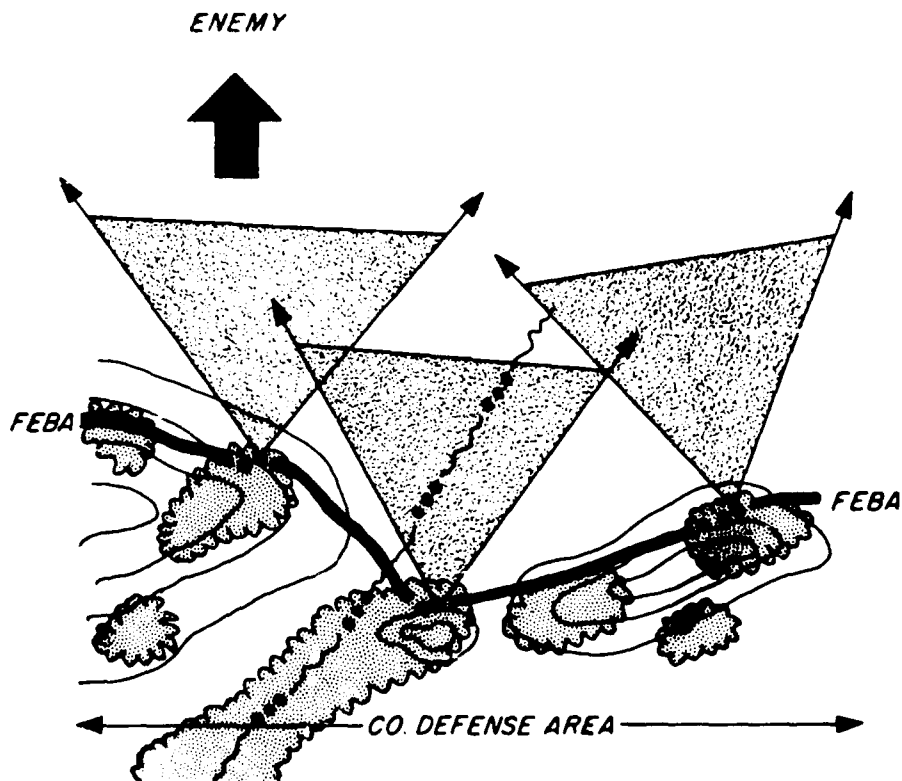
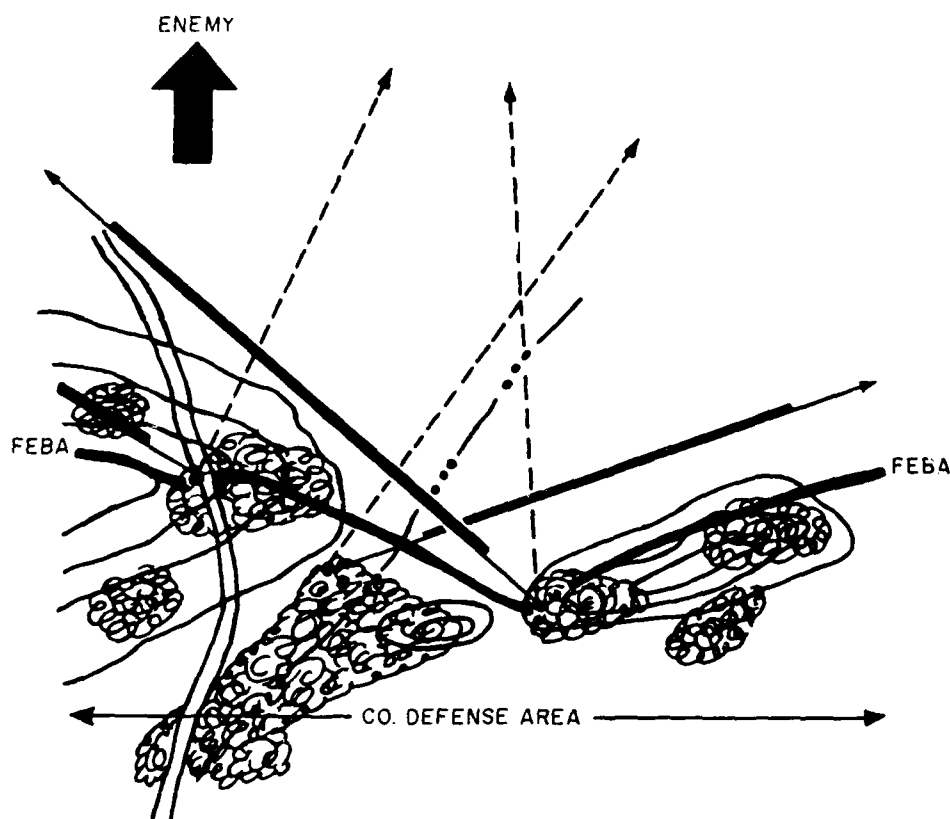


Figure 14-8.—First location of company machine guns.

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Figure 14-9.—Coordinate machine gun fire plan covering company front with interlocking bands of grazing fire.

Figures 14-8 and 14-9 illustrate sound and effective principles for employing machine guns in defense. Coordinating machine gun fire plans within the company only may result in weak uncovered points at the company boundaries. This probable defect is remedied as quickly as possible by the battalion commander. The result of his coordination is the battalion's machine gun fire plan and is the first real coordination achieved. Other troop dispositions are vitally affected by the battalion plan. Until this coordination is complete, company commanders are primarily concerned with protecting only their own companies and areas.

The machine gun platoon of the reserve company is employed in a manner consistent with the expected mission of that company. When the battalion fire plan is in effect, the transition to

the defense is complete and the continuous improvement of positions begins.

STRENGTHENING THE POSITION.—

Strengthening or improving a position into as formidable a defense as the time allows should be the goal of each unit leader. The primary limiting factors in strengthening or improving a position are listed below.

- Time available for reconnaissance by commanders.
- A well-coordinated battalion fire plan. Fire must be exchanged with the enemy so that it will overlap friendly fire at company boundaries to eliminate the possibility of weak points in the defense.

- The extent of digging-in and camouflage. This is limited only by the time an organization spends on a position.

The battalion fire plan (fig. 14-10) is characterized by a system of interlocking bands of grazing fire and a mutual exchange of fires with the enemy so that it overlaps friendly fire at company boundaries. Figure 14-2 shows a portion of the guns of the frontline companies in support of the FEBA. They are covering possible avenues of enemy approach into the position. The machine guns of the reserve company are placed in depth within the battalion defensive area. They are prepared to check deep penetrations. Guns in close support of the FEBA should all have alternate and supplementary as well as primary positions.

The company commander is responsible for selecting general firing positions and assigning missions in a Naval Mobile Construction Battalion. The defense information necessary to

the company commanders is normally communicated to them in a battalion defense order. After receiving the order, the company commander makes a reconnaissance and coordinates the disposition of the rifle platoons with that of the machine guns. He then issues the company defense order. This order must include the following information:

- Primary firing positions
- Direction of the final protective lines
- Sectors of fire
- Elements of fire control

Organization of the ground includes clearing fields of fire, construction of emplacements, cover for personnel, and priority of work.

The weapons platoon commander should prepare an overlay of his fire plan as soon as

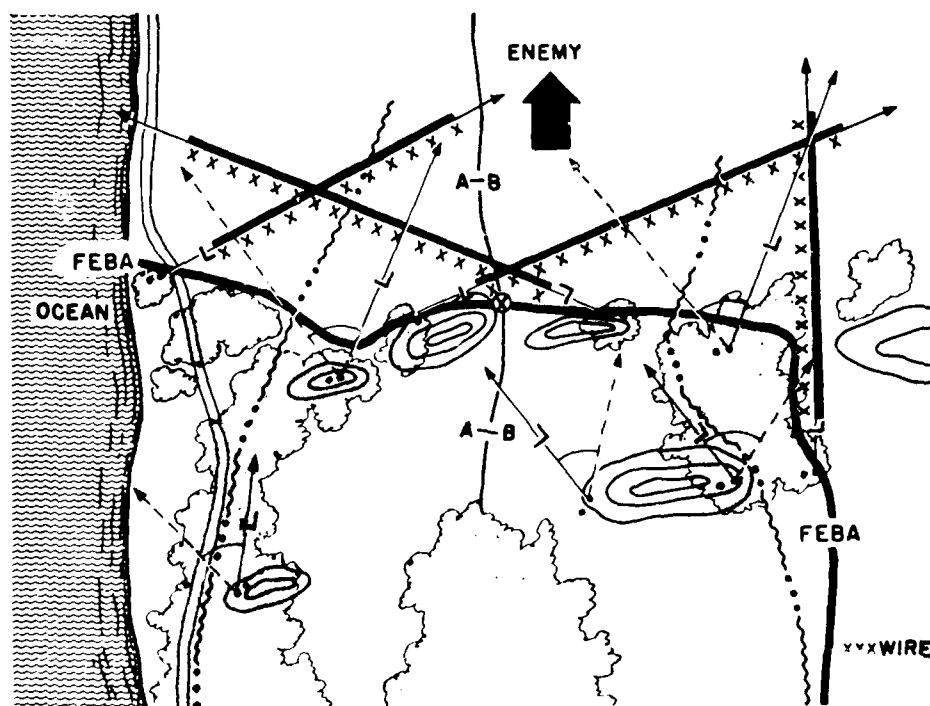


Figure 14-10. Battalion machine gun fire plan.

possible. It must show firing positions; final protective lines, to include any gaps or dead space; and sectors of fire. He submits this overlay to the company commander as an aid in coordinating the rest of his fire.

Machine gun ammunition carriers are used to augment the fire of the unit. However, their fire is not included in the prepared fire plan.

Tactical barbed wire is placed inside final protective lines to slow up an approaching enemy in the areas covered by the grazing fire of the machine guns. The actual emplacement is usually a function of the rifle platoons, but the weapons platoon commander must check to ensure that the barbed wire is properly placed. In addition, protective barbed wire is placed around gun positions to prevent the enemy from coming within hand grenade range.

Fire Control

Having fire control includes all operations connected with the preparation and actual application of fire on a target. It ensures a leader the ability to open fire the instant he desires, adjust the fire of his guns, regulate the rate of fire, shift from one target to another, and cease firing.

The ability of a leader to exercise proper fire control depends primarily on the discipline and technical training of the gun crews. Failure to exercise proper fire control results in danger to friendly troops, loss of the surprise effect, and premature disclosure of positions. It may also cause your troops to fire on unimportant targets, lose time in adjusting fire, and waste ammunition.

The weapons platoon commander must coordinate with the rifle platoons. Coordination ensures that the fire area of machine guns is not covered by fire from the rifle units and vice versa. Arrangements must also be made to afford rifle protection for machine gun emplacements.

The distance between machine gun sections in the defense requires detailed fire control instructions to the sections before a battle begins. Once firing has started, control by the leader is limited to arm and hand signals, personal contact with subordinates through whatever connecting trenches or covered approaches exist, and prearranged signals (pyrotechnics).

Final protective line fires are usually called down by the company or battalion commanders.

However, platoon commanders may be authorized to do so. The battalion commander, in his defense order, will designate the signal (usually a pyrotechnic) for each company. On this signal, machine guns begin firing on the final protective lines. Only guns that protect the unit whose signal has been given will fire.

The rate and duration of fires are normally specified in the unit defense order. The usual rate of section fire on final protective lines is rapid for 2 minutes (150 rounds per minute) followed by medium (75 rounds per minute) fire until ordered to cease. Two guns firing alternate bursts maintain section fire. However, if action to its immediate front does not warrant a heavy volume of fire, the section may adjust the rate to conserve ammunition.

Dead space and gaps can exist in final protective lines unless the defensive position is on perfectly level ground. These spaces must be covered by other battalion weapons or from other units.

Guns in close support of the FEBA open fire on targets of opportunity on the initiative of the section leader. Guns on the final protective lines should not fire if such fire allows them to be spotted prematurely and hence be destroyed. The maximum range at which targets should be engaged by direct methods is 500 meters. Close support guns open fire on all targets of opportunity, depending on cover, concealment, and frequent moves to alternate positions for protection from hostile fires.

Movements to supplementary positions are made on the order of the platoon commander. He should have received instructions from the company or battalion commander. However, in extreme emergencies, the squad leader may effect a move on his own initiative if he spots a flank attack or penetration that may endanger the defensive area. The squad leader takes this initiative only if he cannot contact the platoon commander immediately.

Movement of guns to alternate positions is usually made on the initiative of the section leaders. They can most accurately judge when it is necessary.

When necessary, disabled guns are replaced from rear to front; that is, final protective line guns are replaced by guns in close support of the

FEBA, which are, in turn, replaced by guns originally placed in reserve.

THE SQUAD IN DEFENSE

Each squad leader in the defense must be thoroughly informed about, be aware of, and/or understand the following:

1. The direction of the enemy threat
2. The location of his platoon leader
3. The location of each member of his squad (He normally designates where he wants each man to ensure all-around security.)
4. What means of communication he has available
5. What his mission is, the company's, and the battalion's
6. What action is expected, what support he has, and what to do in different situations

To accomplish his job, the squad leader must give clear, brief, and complete instructions to each member of his squad; the entire squad must know what is expected of them. He must ensure that his squad uses the maximum cover and concealment afforded by the terrain to avoid enemy fire and observation of his men. He must know the additional fire support available to him and how to obtain it, if needed. He must ensure his men are adequately clothed, armed, fed, and sanitation measures are being followed. He has to be thoroughly familiar with resupply procedures (ammo, food, water, clothing) and medical treatment available to his men. He ensures that each member of his squad has alternate positions located and dug in. He ensures that squad members constantly improve their positions. The alternate positions are normally occupied when the primary positions become untenable, but only on orders of a higher authority, such as platoon, company, or battalion commanders. The squad leader is responsible for ensuring that fields of fire are adequate for each member of the squad; that he coordinates plans

with both adjacent squad leaders to ensure that the interlocking fire is accomplished; that the entire squad maintains camouflage discipline; and that the squad maintains a military bearing and organization. His responsibility for his squad goes much further under defensive combat conditions than it does as a work crew or in training. He has to ensure that all men and weapons are ready for extended combat at all times.

The squad leader should ensure each man is aware of the area he must cover by fire (his sector of fire). He establishes the ranges to various possible target locations and ensures that all members of the squad know these ranges (he uses a range card, if necessary). If casualties occur, he extends the coverage of the target area by other members of the squad until replacements can be obtained.

The nonrated SEABEE will have supervisors—team leaders, squad leaders, platoon leaders, and so on—telling him what and when to do things; however, his survival in combat basically depends on the following:

1. How much effort he puts forth in taking care of himself, his equipment, and his clothing.
2. How well he imagines what could happen to him in his defense position and what countermeasures he takes to protect himself and his squad.
3. How thoroughly he understands his squad's, platoon's, company's, and battalion's mission.
4. How well he keeps his weapon serviceable and ready at all times, with ammunition readily available.
5. How well he learns that little things, like keeping dry matches in a plastic bag, being clean shaven, bathing whenever possible, a daily change of socks, and so forth, will help keep his morale high, his disposition cheerful, and help keep him ready for any circumstance.
6. How he learns to buddy up with another squad member so that they look out for each other more than they might do otherwise.

CHAPTER 15

LAND NAVIGATION

Terrain is nothing more than another name for a piece of ground. For our purposes, it is a region or territory viewed for its suitability as a battleground. How you make use of the terrain—its texture, even its color at different times of the day—affects everything you or the enemy do or can do. Both you and the enemy have the terrain of the battlefield in common. More often than not, victory will go to whomever understands and uses the terrain best.

Usually, the terrain dictates troop movements and formations, positions to be defended, and locations of weapons. You can't memorize any definite rules to cover every situation. However, there are certain principles discussed in this chapter that, when applied intelligently, will result in sound solutions or decisions. A knowledge of these principles is not enough to give you the advantage. You must know the terrain intimately to be able to use it properly. Besides making a personal reconnaissance of the terrain, you must be thoroughly familiar with the use of commercially prepared maps as well as maps drawn hastily in the field. You also need to be able to interpret the signs and symbols used on maps, prepare field sketches and overlays, and be able to use the lensatic compass properly.

TERRAIN APPRECIATION

Terrain appreciation is the analysis of any area to determine the effect that the terrain features of the area will have on probable military operations by either of the opposing forces. Terrain can be viewed with either offensive or defensive intentions in mind. However, regardless of the type of mission, each SEABEE leader must evaluate the terrain for both offense and defense.

Then, the leader can anticipate the enemy's analysis of the situation as well as his own. Information on the terrain may be acquired through various sources, but a physical reconnaissance of the area is the most important and reliable method of obtaining accurate information. If a physical reconnaissance is not possible or if additional information is desired, it may be provided by one or more of the following sources:

1. Aerial reconnaissance and photographs
2. Maps of the area
3. Terrain models provided by higher authority
4. Intelligence reports
5. Patrolling
6. Friendly natives, undercover agents, or captured enemy prisoners

COMPONENTS OF TERRAIN

In military terminology, terrain is simply the ground over which we intend or propose to fight. To a military man, the word terrain is an all-inclusive term, referring not only to the ground itself, but to all other conditions that influence a combatant's ability to carry out the assigned mission. For simplicity, we will consider terrain as having two major aspects. The first is weather, climate, and season; the second is topography.

WEATHER, CLIMATE, AND SEASON

WEATHER is the day-to-day changes in atmospheric conditions. CLIMATE is the average weather over an extended period of time. SEASONS are characterized by particular

conditions of weather, such as summer and winter in the United States or the rainy and dry seasons in Southeast Asia. Of these three elements, weather is the most important consideration from a tactical viewpoint. For long-range planning or in the absence of weather information, climatological and seasonal data may be used to estimate weather conditions.

Elements of Weather

Weather consists of several atmospheric elements, each affecting tactics in its own way. These elements are as follows:

1. **TEMPERATURE.** The degree of hotness or coldness of a geographic area.

2. **HUMIDITY.** The percentage of water vapor in the air is a measurement of humidity.

3. **VISIBILITY.** The ability to see both horizontally and vertically, influenced by fog, haze, heat refraction, clouds, or precipitation is known as visibility.

4. **PRECIPITATION.** The depositing of moisture (rain, mist, snow, sleet, hail) from the atmosphere upon the surface of the earth, expressed in kind and amount, is known as precipitation.

5. **WIND.** Wind is the movement of air within the atmosphere and is expressed as strength (velocity) and direction.

6. **PHASES OF THE MOON.** Usually, phases of the moon are expressed in quarters. The first quarter is between the new moon and the full moon; the second, or last quarter, between the full moon and the new moon. The two phases have a direct bearing on night visibility and the amount of rise and fall of the tides.

The Effect of Weather on Tactics

Weather has a direct effect on visibility, movement, and the use and effect of weapons. Horizontal visibility may be materially reduced (resulting in reducing the observation of the enemy or the effect of your fire on them) by fog, haze, heat refraction, or precipitation. Vertical visibility may be restricted by fog, precipitation, or a large mass of low-lying clouds, thus reducing the effectiveness of air support or aerial reconnaissance. Ease of movement, both logistical

and tactical, on roads or cross-country may vary drastically from day to day because of precipitation and temperature changes. A heavy rain may change a passable area into an impassable quagmire; but a severe temperature drop may cause the same quagmire to freeze, thus aiding movement.

Weather affects weapons, both in employment and in the effectiveness of the weapon itself. The trajectory of artillery and mortar rounds is greatly influenced by temperature and humidity. Extreme cold and hot weather require special treatment and handling of gasoline engines, thus affecting the use of equipment and vehicles. The effects of weather are particularly noticeable in air and naval weapon systems support. Air support may be restricted or prevented entirely by clouds, fog, or heavy precipitation. Fog, snow, or heavy rainfall reduce visibility; therefore, naval gunfire support cannot be delivered as effectively, and new targets cannot be rapidly located and engaged.

TOPOGRAPHY

Topography consists of the physical aspects of the earth's surface and includes such features as relief and drainage, vegetation, surface materials, and cultural features.

Relief and Drainage

RELIEF is the term given to the differing areas of elevation and depression on the earth's surface. **DRAINAGE** refers to those areas of surface depression that serve as water runoffs or collection points, such as marshes, swamps, streams, rivers, ponds, and lakes. Knowledge of the general shape of the land is gained through a detailed study of the relief and drainage features. The steepness of slopes; the height and size of hill masses; the depth, the width, and the length of drainage features; and the size of valleys and draws are major features to consider when studying the terrain of a given area. These irregularities in the earth's surface influence tactics by the degree of observation they give the opposing forces, the ease or difficulty of movement, and the degree of protection provided against enemy fire. Flat ground provides equal observation for the opposing forces; normally, high ground in rolling or mountainous terrain provides the better observation.

Any advances made parallel to a series of ridges or to a river or stream are mechanically easier than movement perpendicular to them. The steepness of a slope may limit movement; tanks, for instance, cannot climb slopes greater than 30 degrees.

Flat ground offers little protection against enemy fire; but rolling ground will, particularly against flat-trajectory weapons.

Vegetation

Vegetation is classified for practical purposes as either **NATURAL** or **CULTIVATED**. Natural plant life includes all types of grasses, bushes, and trees growing without man's assistance; cultivated vegetation includes all crops and orchards tended by man. Density, height, and types of growth as well as the diameter of tree trunks are significant features when you are studying vegetation.

Although vegetation may restrict vision, it will offer concealment and limited cover. Of course, the thicker the growth, the harder it will be for the forces to move about.

Surface Materials

Surface materials are studied to determine the trafficability of an area. **TRAFFICABILITY** is defined as the ability of a soil in its normal state to support vehicular traffic moving cross-country or on unimproved roads and trails. In general, all types of soil, except very loose sand, afford good trafficability when dry. However, soils are seldom completely dry. Water may change soil from a hard, baked clay to slippery, impassable mud within a matter of minutes, especially in tropical areas. Another aspect to consider along with the types and condition of the soils is the slope of the ground, the type of vegetation, and the roughness of the surface.

Cultural Features

CULTURAL FEATURES include all the works of man, such as towns, airfields, roads, railroads, and bridges. For military purposes, man-made features are considered an integral part of terrain. Cities and towns are frequently the objectives of an attacking force. For tactical purposes, cultural features may be centers of

resistance as well as physical obstacles in your path. Roads, railroads, and bridges are vulnerable links in logistics and communication networks.

MILITARY ASPECTS OF TERRAIN

Various combinations of weather and topography give certain qualities to an area. These qualities, known as the **MILITARY ASPECTS OF TERRAIN**, must be closely evaluated by each unit leader. These qualities will determine to a very large degree how he will employ his forces and weapons in either the attack or defense. You can remember these military aspects of terrain by using the acronym **KOCOA**.

- K** — Key terrain features
- O** — Observation and fields of fire
- C** — Cover and concealment
- O** — Obstacles
- A** — Avenues of approach

KEY TERRAIN FEATURES

Key terrain is any locality or area that would give the possessor a marked advantage over an enemy. Usually, the factors that make a feature or an area key terrain are superior observation and fields of fire. Obstacles may be considered key terrain if their possession by one force prevents the movement of the opposing force. In some areas, such as mountains and jungles, where movement depends on established roads and paths, routes of communications might be key terrain. A bridge over an unfordable river might be key terrain, particularly if its seizure eliminates the need for an assault crossing. An airfield could be key terrain when its seizure would facilitate the success of local operations or serve as a base to support future operations.

In selecting key terrain, the unit leader is beginning to tie his mission to the ground. Inasmuch as key terrain features offer an advantage to one or both combatants, it is apparent that the defender will strive to retain them while the attacker will try to seize them. For this reason, key terrain is often assigned as the objectives of attacking units; conversely, key terrain will aid the defender in disposing his forces to best maintain his battle position.

Selection of key terrain features will vary in accordance with the mission. In the attack, the unit leader selects key terrain features forward of the line of departure. In the defense, the terrain that must be held to maintain the integrity of the battle position is designated as key terrain.

Selection of key terrain also varies at the different levels of command. For example, at force level, a large city may offer a marked advantage as a communications center or as base for supply and maintenance facilities. At division or regiment level, high ground dominating the city by observation and fields of fire may be important. At battalion, company, and lower echelons, key terrain might be hills and valleys within the general high ground around the city.

OBSERVATION AND FIELDS OF FIRE

OBSERVATION of the battlefield is essential to bring effective fire on the enemy, to control maneuvering of your troops, and to prevent being surprised by the enemy. Observation is classified as either long or short range. Long range observation is that which provides observation in excess of the effective range of small arms fire (usually over 400 meters). Short range observation covers the immediate foreground and extends to the effective range of small arms fire. Observation is limited or denied by such factors as fog, heavy precipitation, heat refraction, darkness, vegetation, cultural features, and relief.

FIELDS OF FIRE are areas into which your weapons can be fired effectively. An ideal field of fire for the defense would be gentle sloping ground, fitted to the trajectory of your weapons, and on which the enemy can be seen with no protection from your fire. This will rarely be found. However, you can improve the natural fields of fire by cutting or burning weeds, grass, and crops; by clearing brush and trees; by demolishing buildings; and by cutting lanes through woods. The commander must exercise caution in ordering such work, since obviously constructed fire lanes can disclose the location of your positions to an observant enemy.

Observation and fields of fire are so closely related that they are considered together. They are not synonymous, but fields of fire are based on observation, since the enemy must be seen to bring effective fire on him. These aspects are

particularly important to the defender. The primary considerations in choosing a defensive position are maximum observation and long fields of fire.

COVER AND CONCEALMENT

COVER is shelter protection from enemy fire, either natural or artificial. Geographical relief features, and drainage areas, cultural features, and other artificial shelters provide cover. Cover from flat trajectory fire is best exemplified by the concept of reverse slope; that is, when there is a projection of relief, such as a hill, between you and the enemy. Cover must be considered in relation to the types of fire encountered. For example, a trench offers excellent protection against rifle fire, but only limited protection against mortar or artillery fire.

CONCEALMENT is protection from observation. Vegetation, cultural features, geographical relief features, drainage areas, weather conditions, and darkness can provide protection from observation. Frequently, you can obtain concealment by properly evaluating and using just the terrain. At other times, you may need artificial means (camouflage) in addition to natural, available concealment.

Concealment is the reverse concept of observation. Since the defender usually has the opportunity to choose the ground he wishes to defend, he selects positions that take maximum advantage of natural cover and concealment, adding field fortifications and natural concealment with camouflage to improve the position. It is important that you judge your own cover and concealment by looking at it from a potential attacker's point of view.

OBSTACLES

Obstacles are obstructions that stop or divert troop movement. Common natural obstacles of military value include mountains, rivers, streams, lakes, marshes, gullies, steep inclines, and heavily wooded areas. Common artificial obstacles include mine fields, cut and fills, trenches, antitank ditches, roadblocks, barbed wire, blown bridges, and road craters. The proper evaluation of natural obstacles permits the most effective use of artificial obstacles. Obstacles perpendicular to

the advance route of the enemy generally favor the defending force. Obstacles parallel to the enemy's advance may favor the enemy by protecting his flanks, although the obstacles may also limit his lateral movement. The effectiveness of any obstacle must be carefully examined. An obstacle by itself is rarely an absolute block to military movement by a determined enemy. A defender who puts full faith in any obstacle by itself stands the risk of being surprised by enemy movement over or through that obstacle. Maximum effectiveness is gained from an obstacle kept under observation and fire.

AVENUES OF APPROACH

An avenue of approach is a terrain feature or combination of features that offer a maneuvering unit a suitable route of movement to their objective. The desirable characteristics of an avenue of approach are listed below.

- **EASE OF MOVEMENT** toward the objective.
- **COVER** and **CONCEALMENT** from the defender's fire and observation.
- **FAVORABLE OBSERVATION** and **fields of fire** for the attacker.
- Adequate **ROOM FOR MANEUVER** and dispersal by the attacking unit.

You, as a defender, must pay particular attention to all avenues of approach. These approaches into your SEABEE position represent potential weak spots in the defense, and SEABEES must be positioned to block and cover them effectively. As a defender, you must also consider the use of these avenues of approach by your own forces should you wish to launch a counterattack.

MAPS AND THE COMPASS

In a combat situation, your life may depend upon your ability to read and use a map and compass. If you are on a night patrol and become separated from the rest of the patrol, you will have

to find your way back to the friendly lines by yourself. This might be next to impossible without using a map that shows the approximate location of the friendly forces. With a map and compass, you should be able to locate your position and then follow a route to your destination.

In this phase of our discussion, we will first discuss military maps. Special attention will be given to topics that will help you to read maps accurately and intelligently. Later, we will discuss the use of a lensatic compass. Then, we will include instruction in how to orient a map with a lensatic compass.

MAPS

A map is a small-scale, flat-surfaced representation of a part of the surface of the earth. Man-made and natural features are shown by the use of symbols, lines, colors, and forms. (See fig. 15-1.) Maps show the location and distances between ground features, such as towns, populated areas, roads, airfields, streams, and other lines of communication. They also indicate variations in the landform and the height of natural features.

Some of the types of maps you will use are given below:

- **TOPOGRAPHIC MAP.** This map portrays terrain and landforms in a measurable form as well as the horizontal positions of the features represented. The vertical positions, or relief, are normally represented by contours. On relief maps the elevations and contours are measured from a specified vertical datum plane, usually mean sea level.

- **PLANIMETRIC MAP.** This map presents only the horizontal positions for the features represented. The omission of relief in a measurable form distinguishes it from a topographic map.

- **PHOTOMAP.** This map is a reproduction of an aerial photograph or a photomosaic made from a series of aerial photographs. Photomaps show grid lines, marginal data, place names, route numbers, important elevations, boundaries, approximate scale, and approximate direction.

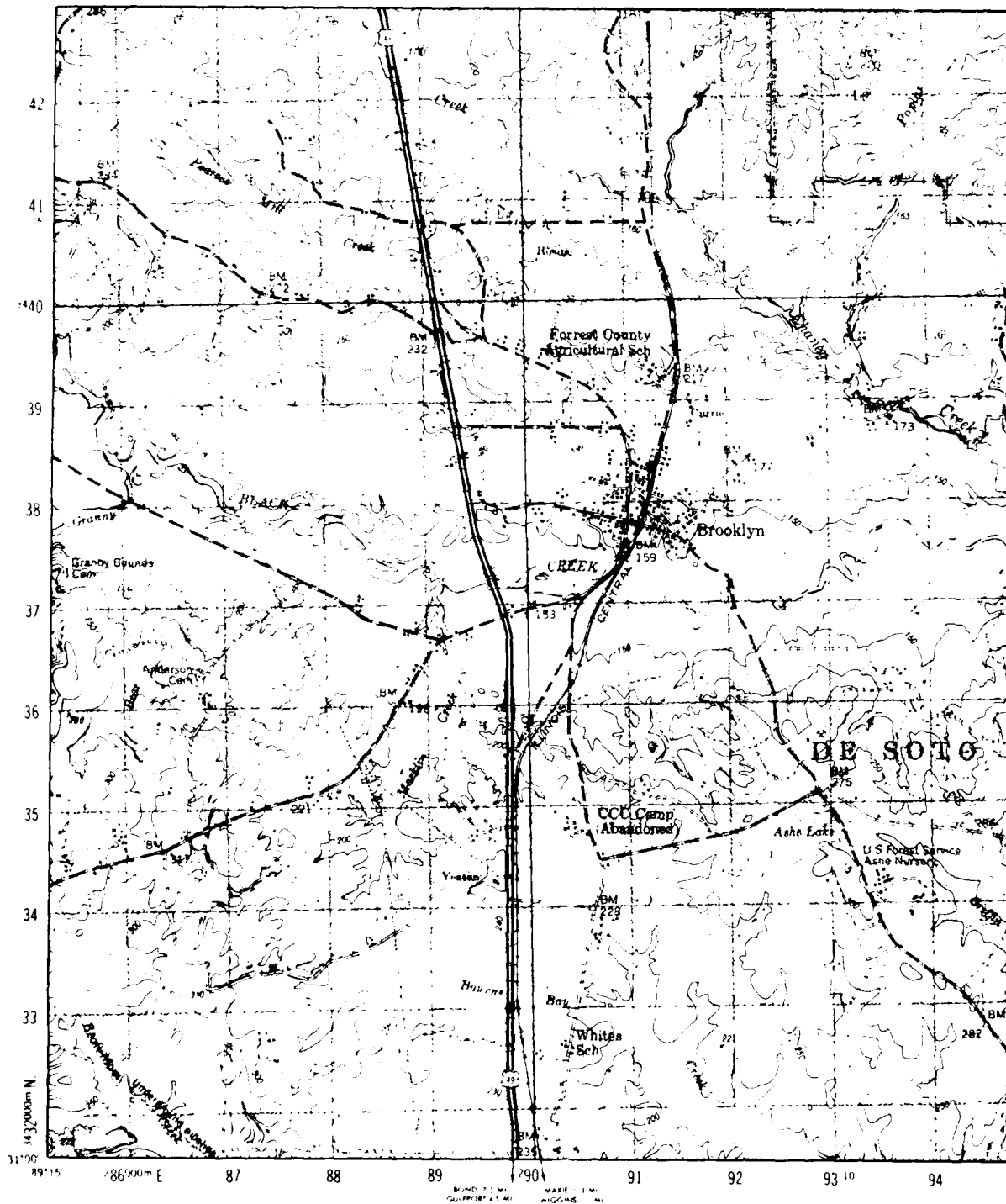
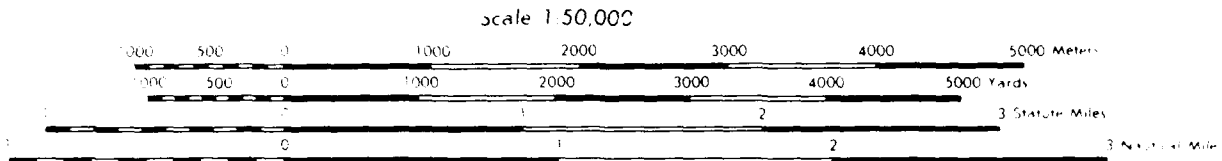


Figure 15-1.—Portion of military map.

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Chapter 15—LAND NAVIGATION

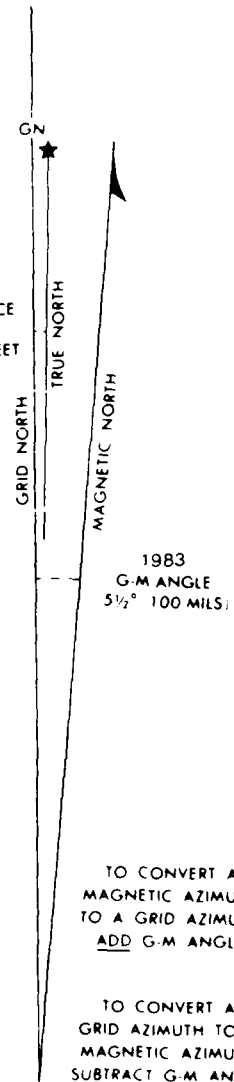


CONTOUR INTERVAL 10 FEET

SPHEROID
GRID
PROJECTION
VERTICAL DATUM
HORIZONTAL DATUM
CONTROL BY
PREPARED BY
PRINTED BY

CLARKE 1866
1,000 METER UTM, ZONE 16 (BLACK NUMBERED LINES)
TRANSVERSE MERCATOR
SEA LEVEL DATUM OF 1929
1927 NORTH AMERICAN DATUM
USC&GS, USGS AND USED
U.S. ARMY TOPOGRAPHIC COMMAND
U.S. ARMY TOPOGRAPHIC COMMAND 4-71

GRID CONVERGENCE
1°06' (20 MILS.)
FOR CENTER OF SHEET



SAMPLE 100,000 METER GRID SQUARE	100 METER REFERENCE
	<p>1 Read large numbers labeling the VERTICAL grid line left of point and estimate tenths (100 meters) from grid line to point</p> <p>2 Read large numbers labeling the HORIZONTAL grid line below point and estimate tenths (100 meters) from grid line to point</p> <p>Example: 123456</p>
<p>100,000 METER SQUARE IDENTIFICATION</p> <p>BK CK</p> <p>900</p>	<p>WHEN REPORTING ACROSS A 100,000 METER LINE PREFIX THE 100,000 METER SQUARE IDENTIFICATION IN WHICH THE POINT LIES</p> <p>Example BK123456</p>
<p>GRID ZONE DESIGNATION</p> <p>16R</p>	<p>WHEN REPORTING OUTSIDE THE GRID ZONE DESIGNATION AREA PREFIX THE GRID ZONE DESIGNATION</p> <p>Example 16RBK123456</p>

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Figure 15-1.—Portion of military map—Continued.

SEABEE COMBAT HANDBOOK



Prepared under the direction of the Department of Defense and published by the U.S. Army Topographic Command, Washington, D.C.



LEGEND

MAP INFORMATION AS OF 1983

IN DEVELOPED AREAS ONLY THROUGH ROADS ARE CLASSIFIED

Hard surface, heavy duty road, four or more lanes wide	4 LANES (6 LANES)	Improved light duty road, street	
Hard surface, heavy duty road, two lanes wide, three lanes wide	2 LANES	Unimproved dirt road	
Hard surface, medium duty road, four or more lanes wide	4 LANES (6 LANES)	Trail	
Hard surface, medium duty road, two lanes wide, three lanes wide	2 LANES	Route markers: Interstate, Federal, State	66 87
Buildings		Mines: Open pit, Horizontal shaft, Vertical shaft, Prospect	
Barns, sheds, greenhouses, stadiums, etc.		Bench mark, monumented	BM X 792
RAILROADS		Bench mark, non monumented	X 431
Standard gauge	Single track Multiple track	Spot elevations in feet: Checked, Unchecked	168 168
Narrow gauge		Light, lighthouse, Windmill, wind pump	
in street		Woodland, Scrub	
Car line		Vineyard, Orchard	
BOUNDARIES		Intermittent lake	
National		Intermittent stream, Dam	
State, with monument		Marsh or swamp	
County		Rapids, Falls	
County subdivision		Large rapids, Large falls	
Corporate limits	MIL RES		
Military reservation			
Other reservation			

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Figure 15-1.—Portion of military map—Continued.

◆ **PICTOMAP.** A map on which the photographic imagery of a standard photomap has been converted into interpretable colors and symbols.

Reference Systems

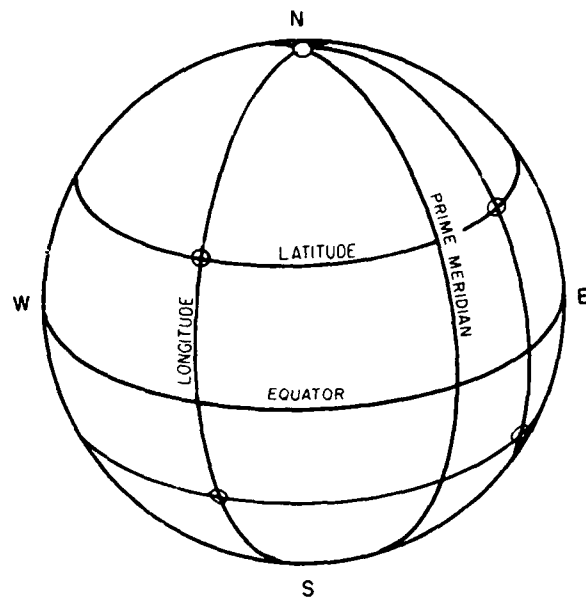
One of the oldest reference systems is based upon the geographic coordinates—meridians and parallels. **MERIDIANS** are great circles of north-south rings crossing the equator at right angles and converging at the North and South Poles. (See fig. 15-2.) One meridian, that runs through Greenwich, England, is known as the prime meridian. Meridians are used to measure **LONGITUDE**, the distance of a point east or west

of the prime meridian. **PARALLELS** are great circles of east-west rings running parallel to the equator. (See figs. 15-2 and 15-3.) Parallels are used to measure **LATITUDE**, the distance of a point north or south of the equator. Using meridians and parallels, you can locate any point on the earth's surface.

Geographic coordinates are expressed in angular measurement. The earth is divided into 360 degrees; each degree into 60 minutes; and each minute into 60 seconds. The degree is symbolized by °; the minute by ' ; and the second by " .

Starting with 0° at the equator, the parallels of latitude are numbered to 90° both north and south. The extremities are the North Pole at 90° north latitude and the South Pole at 90° south latitude. Latitude can have the same numerical

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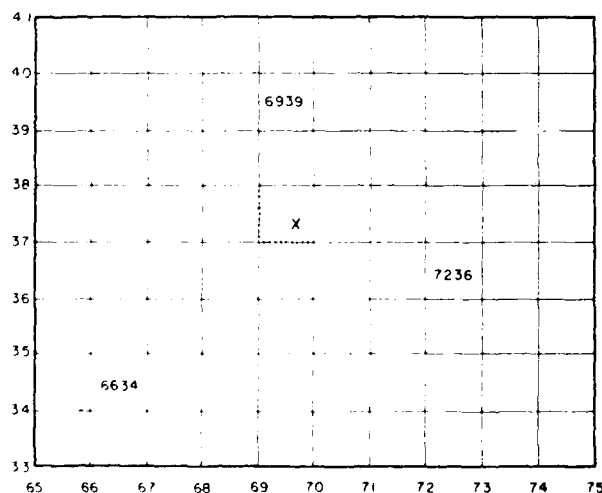
Starting with 0° at the prime meridian, longitude is measured both east and west around the world. Lines east of the prime meridian are numbered from 0° to 180° and are identified as east longitude. Lines west of the prime meridian are numbered 0° to 180° and are identified as west longitude. The direction E or W must always be given to longitude. The line directly opposite the prime meridian, 180° , may be referred to as either east or west longitude.

Military maps are divided into grids to provide a uniform system for referencing and making measurements. Military grids consist of two sets of equally spaced parallel, straight lines intersecting at right angles and forming a series of squares. Each grid line is an even interval of the selected measurement unit, such as yards or meters. A portion of a military grid, or map, is shown in figure 15-1. The dimensions and orientation of different types of

The regularly spaced lines that make up the grids on any large-scale map are divisions of the 100,000-meter square; the lines are spaced at 10,000- or 1000-meter intervals. Each of these lines is labeled at both ends with a number showing its relation to the origin of the zone. For the 1000-meter grid, except for the numbers labeling the first grid line in each direction from the southwest corner of the sheet, the last three digits (000) of the number are omitted. (See fig. 15-1.) Two digits of the numbers are printed in large type, and the same two digits appear at intervals along the grid line on the face of the map. They are called the **PRINCIPAL DIGITS** and represent the 10,000 and 1000 digits of the grid number; they are of major importance to the map reader because they are numbers he will use

most often for referencing points. The smaller digits complete the COORDINATES of the grid lines, but they are rarely used for point designation. On sheets with grid line spacing at 10,000 meters, only one principal digit is shown, representing the 10,000 digit of the grid number.

The designation of a point is based on the military principle of "Read RIGHT then UP." The precision desired determines the number of digits to be read beyond the principal digits. Remember that the term grid coordinate often indicates both the 100,000-meter square identification and the desired number of digits. In many instances, it is a tactical requirement that the 100,000-meter square identification be included in any point designation. Figure 15-4 illustrates a section of simple grid system. Each line is numbered, starting at the lower left-hand corner, reading to the right and up. Remember, when you read a military map you should always read from left to right and from bottom to top. Three squares in figure 15-4 have numbers in them to identify that particular grid square. The letter X has been placed in grid square 6937. To locate this point more precisely, see figure 15-5. You can see that the sides of the grid square have been divided into ten parts. This can be done by eye or with a scale. As shown in this figure, the X is located at coordinate 697373. The grid



54.182

Figure 15-4.—Grid system.

coordinates are written as one number but always contain an even number of digits. Examples are 6937 and 697373.

Elevation and Relief

A knowledge of map symbols, grids, scale, and distance gives enough information to identify two points. You locate them, measure between them, and determine how long it would take to travel between them. But what would happen if there should be a 300-foot cliff between the two points? The map user must also become proficient in recognizing the various landforms and irregularities of the earth's surface. Then he is able to determine the elevation and differences in the height of all terrain features.

1. **DATUM PLANE.** This is a reference from which vertical measurements are taken. The datum plane for most maps is mean, or average, sea level.

2. **ELEVATION.** This is defined as the height (vertical distance) of an object above or below a datum plane.

3. **RELIEF.** Relief is the representation of the shape and height of landforms and the characterization of the earth's surface.

The elevation of points and the relief of an area affect the movement and deployment of units by limiting the route along which they may travel, their speed of movement, and the ease or difficulty of attacking or defending an area. Also relief affects observation, fields of fire, cover, concealment, and the selection of key terrain features.

Contour Lines

There are several ways of indicating elevation and relief on maps. The most common way is by contour lines. A **CONTOUR LINE** is a line representing an imaginary line on the ground along which all points are at the same elevation.

Contour lines indicate a vertical distance above or below a datum plane. Starting at sea level, normally the zero contour, each contour line represents an elevation above sea level. The vertical distance between adjacent contour lines is known as the **CONTOUR INTERVAL**. The

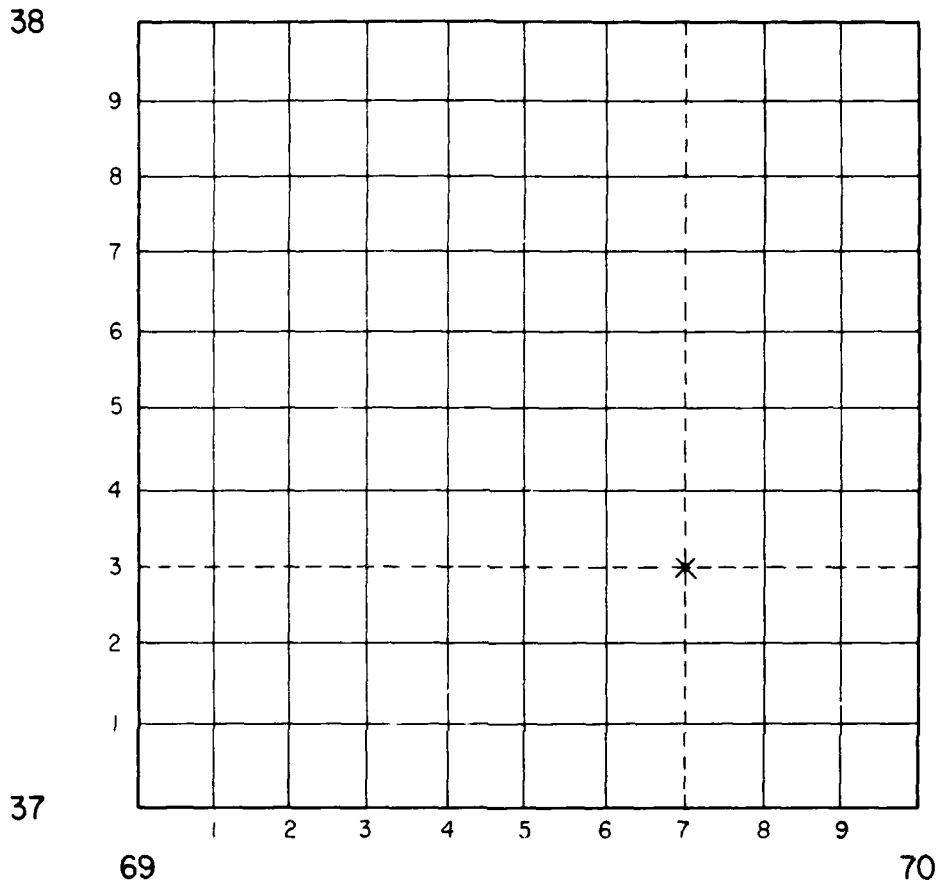


Figure 15-5.—Grid square, close-up.

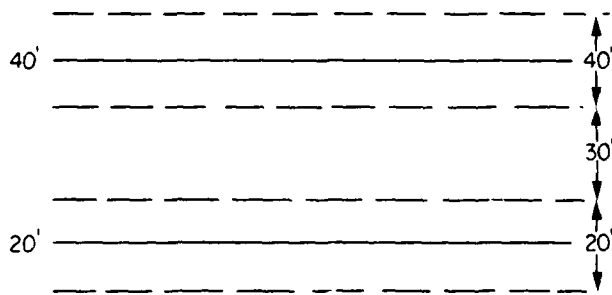
amount of the contour interval is given in the marginal information. On most maps, the contour lines are printed in brown. Starting at zero elevation, every fifth contour line is drawn with a heavier line. These are known as **INDEX CONTOURS**. Some place along each index contour the line is broken and its elevation is given. The contour lines falling between index contours are called **INTERMEDIATE CONTOURS**. They are drawn with a finer line than the index contours and, usually, do not have their elevations given.

Using the contour lines on a map, you may determine the elevation of any point as follows:

1. Find the contour interval of the map from the marginal information, and note both the amount and the unit of measure.
2. Find the numbered contour line (or other given elevation) nearest the point for which the elevation is being sought.
3. Determine the direction of slope from the numbered contour line to the desired point.
4. Count the number of contour lines that must be crossed to go from the numbered line to the desired point and note the direction—up or down. The number of lines crossed multiplied by the contour interval is the distance above or below the starting value.

If the desired point is on a contour line, its elevation is that of the contour.

For a point between contours, most military needs are satisfied by estimating the elevation to an accuracy of one-half of the contour interval.

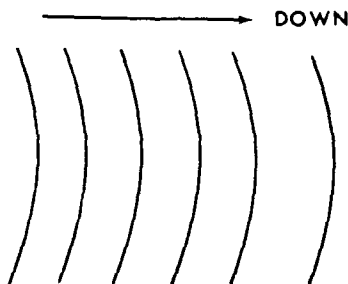
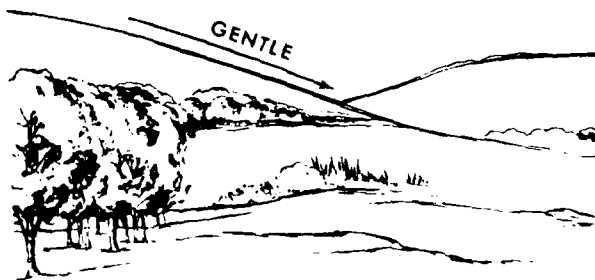


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Figure 15-6.—Estimating elevations between contour lines.

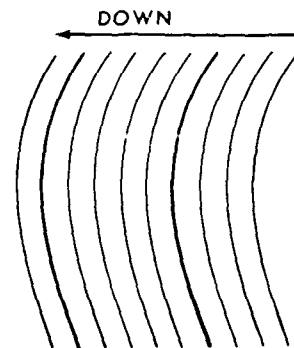
All points less than one-fourth of the distance between the lines are considered to be at an elevation one-half of the contour interval above the lower line (fig. 15-6).

To estimate the elevation of the top of an unmarked hill, add half the contour interval to the elevation of the highest contour line around the hill.



45.784

Figure 15-7.—Uniform gentle slope.



45.785

Figure 15-8.—Uniform steep slope.

To estimate the elevation of the bottom of a depression, subtract half the contour interval from the value of the lowest contour around the depression.

On some maps, the index and intermediate contour lines do not show the elevation and relief in as much detail as may be needed; then **SUPPLEMENTARY CONTOURS** may be used. These contour lines are dashed brown lines, usually at one-half of the contour interval for the map. A note in the marginal information indicates the interval used. They are used exactly like solid contour lines.

On some maps, the contour lines may not meet the standards of accuracy but are sufficiently accurate in both value and interval to be shown

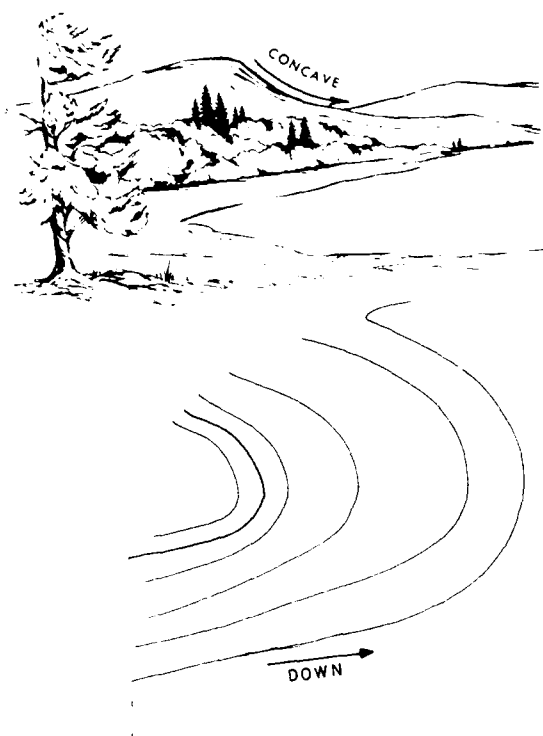


Figure 15-9.—Concave slope.

45.786

as contours rather than as form lines. On maps of this type, the contours are considered as approximate and are shown with a dashed symbol; elevation values are given at intervals along the heavier (index contour) dashed lines. The contour note in the map margin identifies them as approximate contours.

In addition to the contour lines, bench marks and spot elevations are used to indicate points of known elevation on the map. BENCH MARKS, the more accurate of the two, are symbolized by a black X, for example, X BM 124. The elevation value shown in black refers to the center of the X. SPOT ELEVATIONS, shown in brown, generally are located at road junctions, on hilltops and other prominent landforms. The symbol \triangle designates an accurate horizontal control point. When a bench mark and a horizontal control point are located at the same point, the symbol BM \triangle is used.

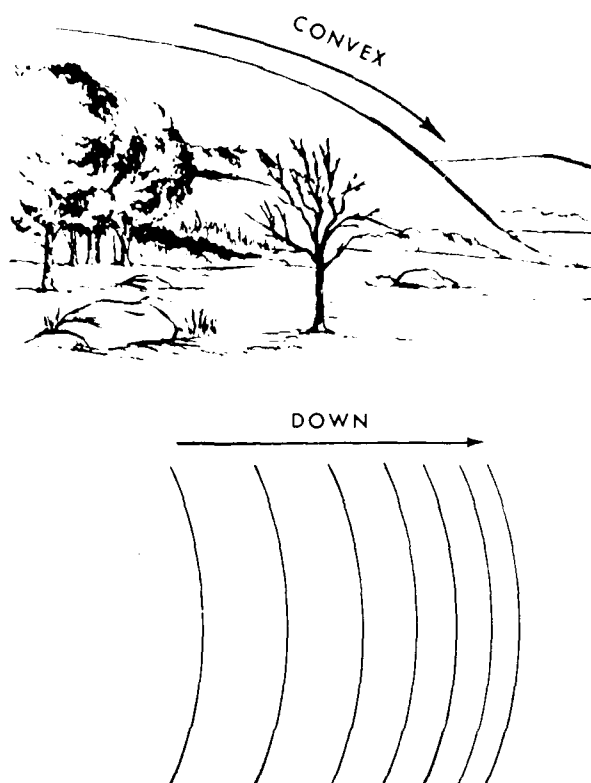


Figure 15-10.—Convex slope.

45.787

The spacing of the contour lines indicates the nature of the slope. Contour lines evenly spaced and wide apart indicate a uniform, gentle slope (fig. 15-7). Contour lines evenly spaced and close together indicate a uniform, steep slope. The closer the contour lines are to each other, the steeper the slope (fig. 15-8).

Contour lines closely spaced at the top and widely spaced at the bottom indicate a concave slope (fig. 15-9). Considering relief only, an observer at the top of a concave slope can observe the entire slope and the terrain at the bottom. However, a unit attacking up a concave slope would have no cover or concealment from observers or weapons at or near the top; also, farther up the slope, the climb would be more difficult.

Contour lines widely spaced at the top and closely spaced at the bottom indicate a convex slope (fig. 15-10). An observer at the top of a

convex slope would have no observation of most of the slope or of the terrain at the bottom. But a unit attacking up a concave slope would have a much greater degree of cover and concealment than on a concave slope; also, the climb farther up the slope, would be easier.

In order to show the relationship of land formations to each other and how they would be symbolized on a contour map, stylized panoramic sketches of the major relief formations are drawn. Then a contour map of each sketch is developed. Each of figures 15-10 through 15-17 shows a sketch and a map with a different relief feature and its characteristic contour pattern.

1. HILL. This is a point or small area of high ground (fig. 15-11). When you are located on a hilltop, the ground slopes down in all directions.

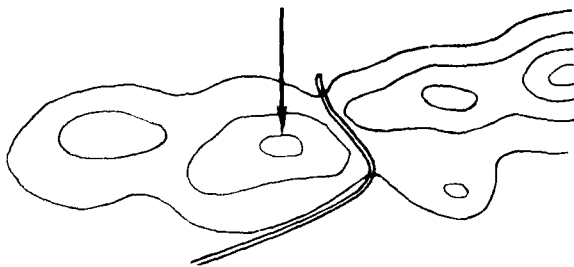
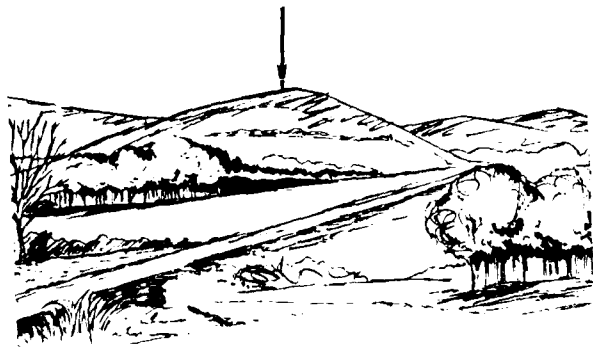
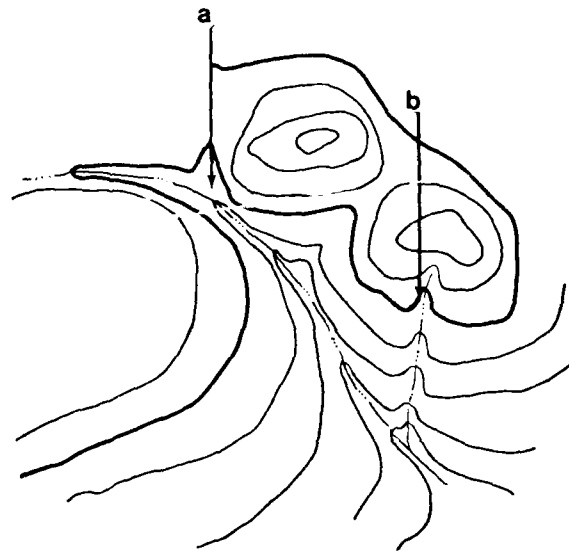
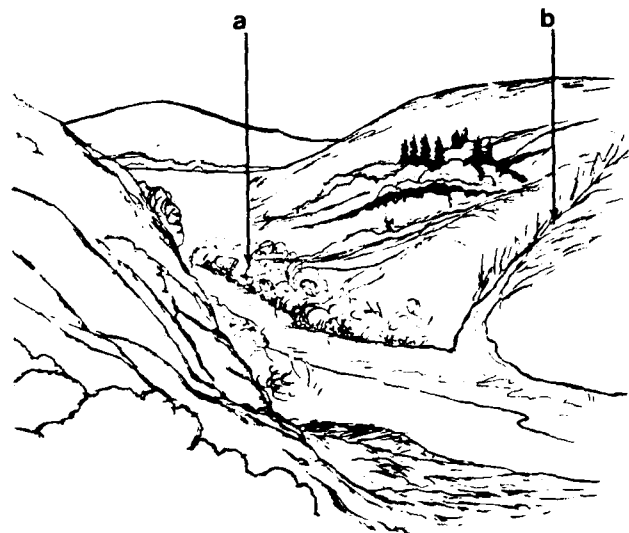


Figure 15-11.—Hill.

45.788



45.789

Figure 15-12.—(a) Valley; (b) Draw.

2. VALLEY. A valley is a stream's course that has at least a limited extent of reasonably level ground bordered on the sides by higher ground. (See fig. 15-12, views A, top and bottom.) The valley generally has maneuvering room within its confines. Contours indicating a valley are U-shaped and tend to parallel a major stream before crossing it. The more gradual the fall of

a stream, the farther each contour parallels it. The curve of the contour crossing always points upstream.

3. **DRAW:** A draw is a less developed stream course in which there is essentially no level ground and, therefore, little or no maneuvering room within its confines (see fig. 15-12, view B, top and bottom). The ground slopes upward on each side and towards the head of the draw. Draws occur frequently along the sides of ridges at right angles to the valleys between them. Contours indicating a draw are V-shaped, with the point of the V toward the head of the draw.

4. **RIDGE:** Normally, a ridge is a line of high ground with minor variations along

its crest. (See fig. 15-13, views A, top and bottom.) The ridge is not simply a line of hills; all points of the ridge crest are appreciably higher than the ground on both sides of the ridge.

5. **SPUR:** A spur is usually a short, continuously sloping line of higher ground normally jutting out from the side of a ridge. (See fig. 15-13, views B, top and bottom.) A spur is often formed by two roughly parallel streams cutting draws down the side of a ridge.

6. **SADDLE:** A saddle is a dip or low point along the crest of a ridge. A saddle is not necessarily the lower ground between two hilltops; it may be simply a dip or break along an otherwise level ridge crest (fig. 15-14).

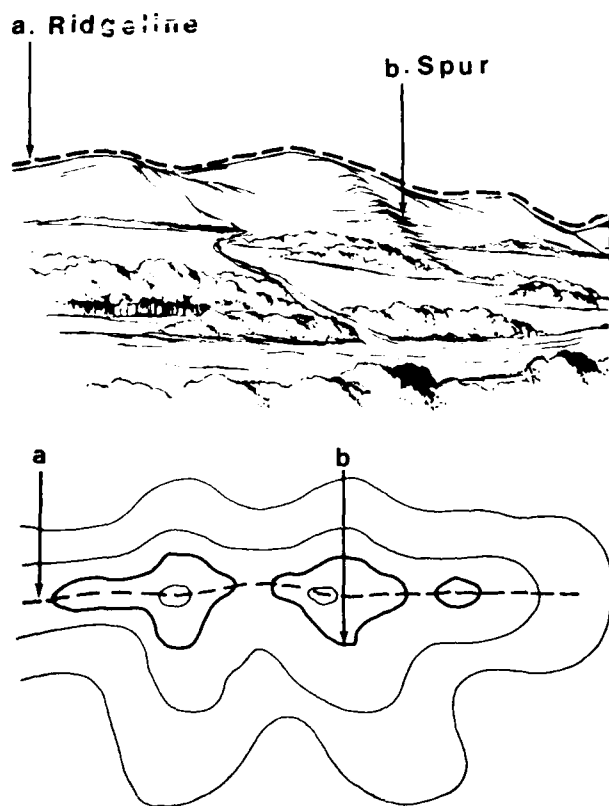


Figure 15-13.—(a) Ridge; (b) Spur.

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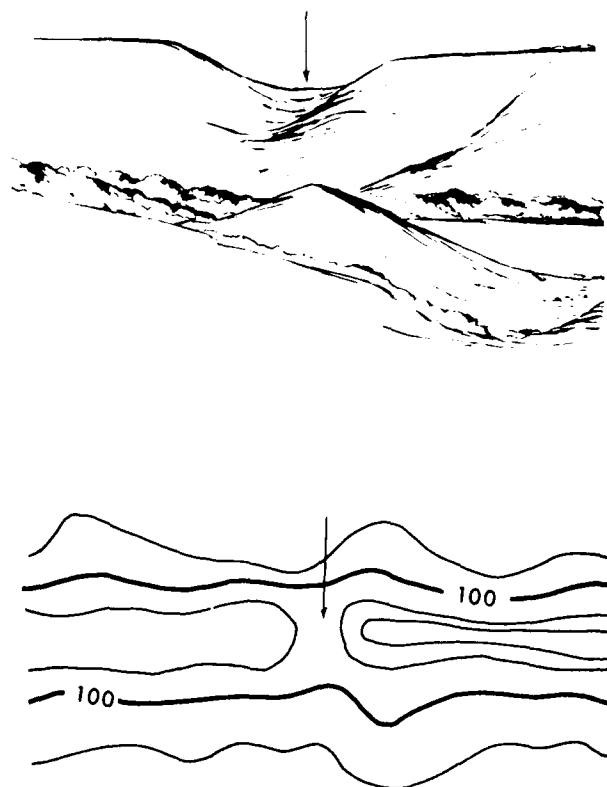


Figure 15-14.—Saddle.

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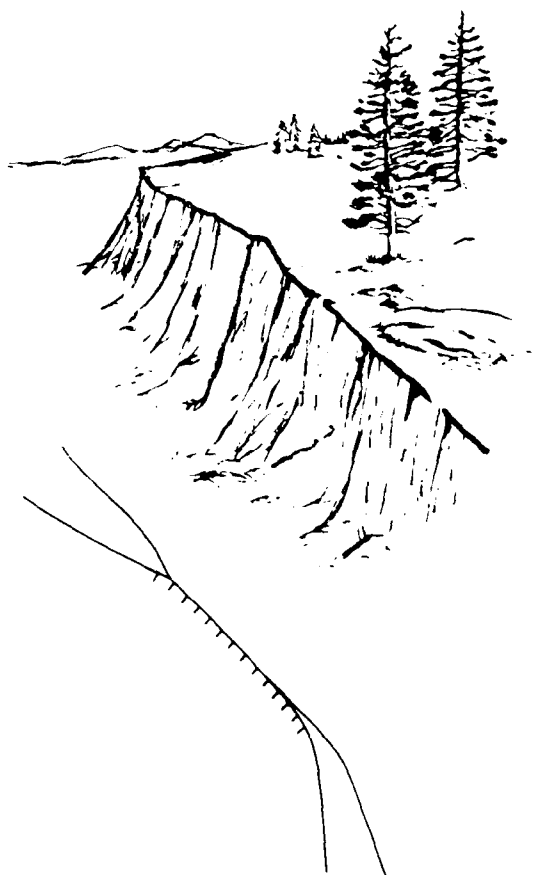


Figure 15-15.—Cliff.

45.794

7. **CLIFF:** A cliff is a vertical or near vertical slope (fig. 15-15). When a slope is so steep that it cannot be shown at the contour interval without the contours coming together, it is shown by a ticked "carrying" contour or contours. The ticks always point toward lower ground.

8. **CUTS and FILLS:** Cuts and fills are man-made features caused when the bed of a road or railroad is graded or leveled by cutting through high areas and filling in low areas along the right-of-way. (See fig. 15-16, views A and B, top and bottom.)

9. **DEPRESSION.** A depression is a low point or sinkhole, surrounded on all sides by higher ground (fig. 15-17).

Slope

The rate of rise or fall of a ground form is known as its slope and may be described as being

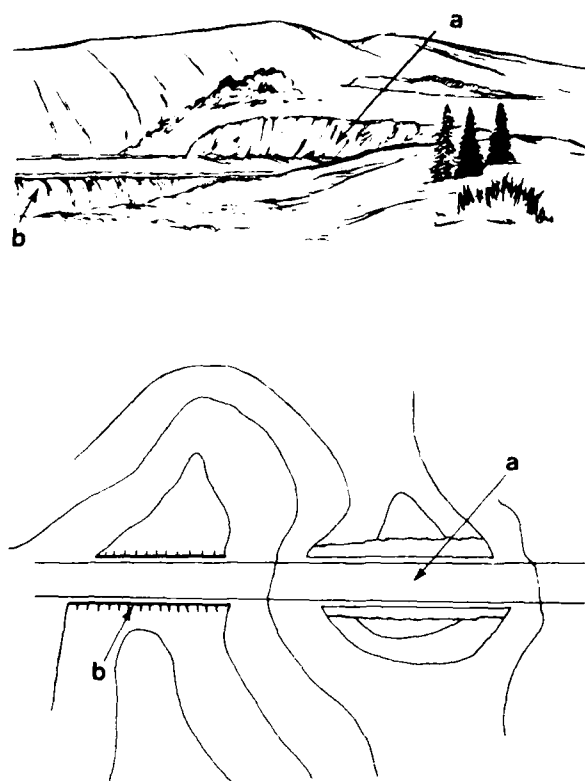


Figure 15-16.—(a) Cut; (b) Fill.

45.793

steep or gentle. The question arises as to how steep or how gentle? The speed at which equipment or personnel can move is affected by the slope of the ground. Most equipment has a limit on the steepness of slope it can negotiate. So a more exact way of describing a slope is demanded. Slope may be expressed in several ways, but all of them depend upon a comparison of vertical distance (VD) to horizontal distance (HD) (fig. 15-18). VD is the difference between the highest and lowest elevations of the slope and is determined from the contour lines. HD is the horizontal ground distance between the highest and the lowest elevations of the slope.

The VD and HD must be expressed in the same units. Both measurements must be made with extreme accuracy in order to have a valid determination of steepness. The computations normally are made for only the steepest part of a slope.

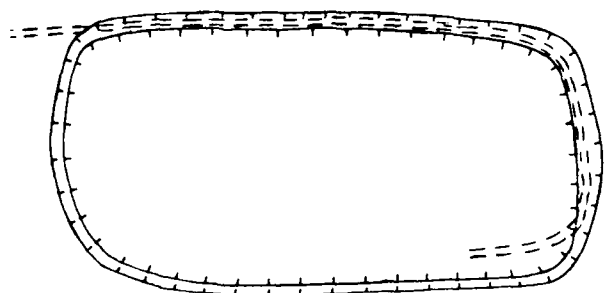
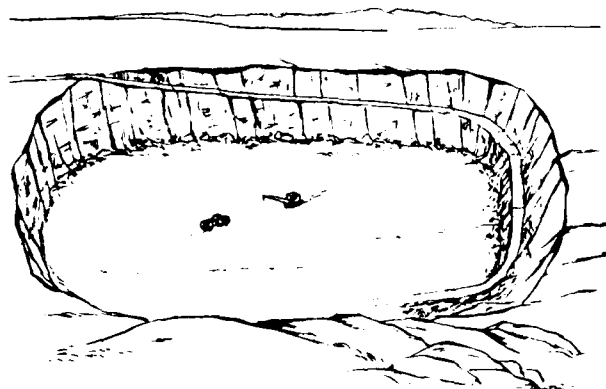


Figure 15-17.—Depression.

45.792

Scale and Distance

A map is a graphic representation of an area and, therefore, is not made to full scale (actual size). Since it is not full size, some means of measuring the distance from one point on the map to another is necessary. This is done with the aid of a scale.

There are two types of scales in general use on military maps. The first is called a graphic scale and is indicated by a special scale legend that is printed on the map. The second type of scale is

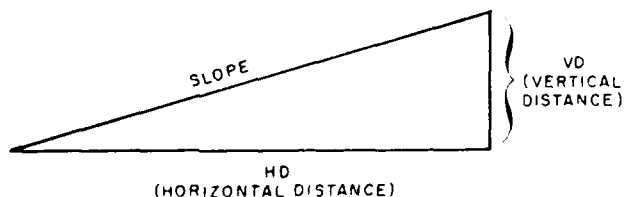
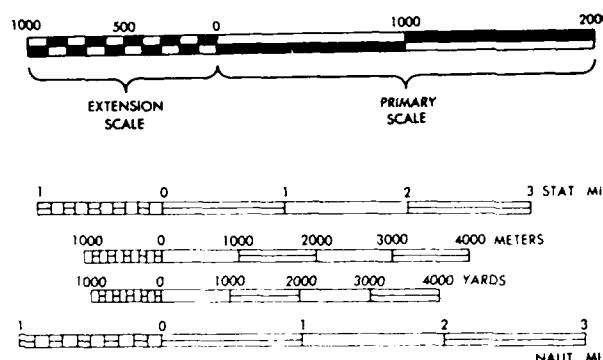


Figure 15-18.—Slope diagram.

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Figure 15-19.—Graphic scale.

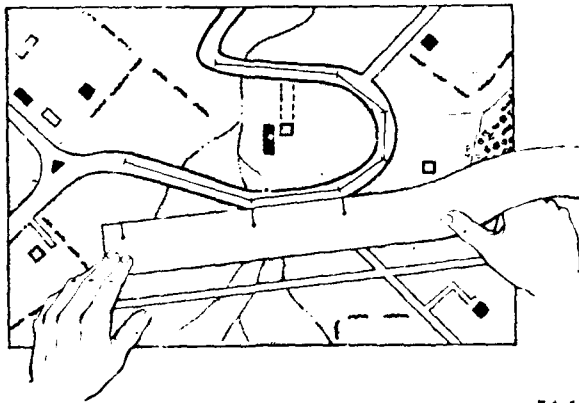
the ratio between the horizontal distance on the map and the corresponding distance on the ground.

The GRAPHIC SCALE that is printed on your map is especially made for that map and should not be used on any other map. Figure 15-19 shows a typical graphic scale. To the right of the zero (0), the scale is marked in full units of measure and is called the PRIMARY SCALE. The part to the left is zero (0) and is divided into tenths of a unit and is called the EXTENSION SCALE. Most maps have three or more graphic scales, each of which indicates distance in a different unit of measure. To determine the straight line distance between two points on a map use the following steps:

1. Lay the straightedge of a piece of paper on the map so that the edge of the paper touches both points.
2. Make a mark on the edge of the paper at each point.
3. Move the paper down to the graphic scale, and from the scale, read the ground distance between the points. Be sure to use the scale that indicates the unit of measure desired.

To measure distance along a winding road, stream, or any other curved line, the straightedge of a piece of paper is used again.

1. Make a mark at or near one end of the paper and place it at the point



54.185

Figure 15-20.—Measuring curved line distance on a map.

from which the line is to be measured, as in figure 15-20.

2. Align the edge of the paper along a straight portion, and make a tick mark on both the map and the paper at the end of the aligned portion.

3. Keeping both tick marks together, place the point of the pencil on the paper's tick mark to hold it in place. Pivot the paper until another straight portion is aligned and make another mark on both map and paper.

4. Continue in this manner until the measurement is complete. Then place the paper on the graphic scale and read the ground distance.

The **RATIO-TYPE SCALE** is simply a comparison between a given distance measured on the map and on the ground. It is independent of any unit of measure. A scale of 1/25000 means that one unit of measure on the map is equal to 25,000 of the same units of measure on the ground. The ground distance between two points may be determined by measuring between the points on the map and multiplying the map measurement by the scale. For example, the distance between two bridges on a certain map is 15 inches. The scale of the map is 1:50000. Therefore, the actual distance on the ground is found by multiplying 15 inches by 50,000 (15 times 50,000 equals 750,000 inches). If this is to mean anything to you, change it to units that can be easily pictured in your mind. These units might be feet, yards, meters, kilometers, or miles. To change the 750,000 inches to feet, you need to divide by 12 (the number of inches in a foot); hence, 750,000 divided by 12 equals 62,500 feet. To change the 62,500 feet to miles, divide

again by 5,280 (the number of feet per mile); thus 62,500 divided by 5,280 equals 11.8 miles.

By using either of the methods described above, you can determine the distance between any two points.

Direction

Directions are expressed in everyday life as right, left, straight ahead, and so forth. But the question arises, To the right of what? Military personnel require a method of expressing a direction that is accurate, adaptable for use in any area of the world, and has a common unit of measure.

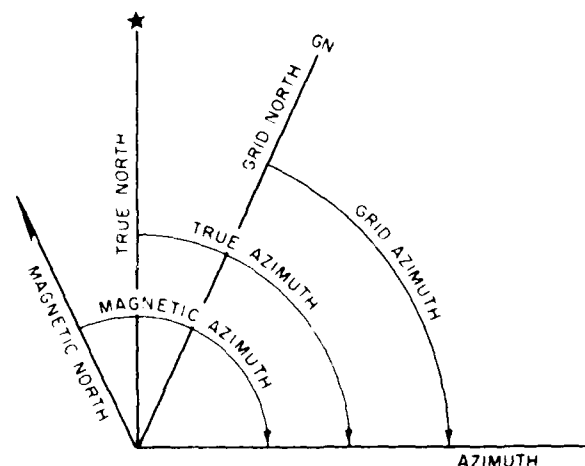
Directions are expressed as units of angular measure, and there are several systems used.

1. The most commonly used unit of angular measure is the degree with its subdivisions of minutes and seconds.

2. Another unit, less frequently used, is the mil (abbreviated m). For the U.S. military purposes, a complete circle is divided into 6400 mils. The mil is commonly used in artillery, tank, and mortar gunnery. It is convenient for many practical uses because it is approximately one unit of length at a distance (range) of one thousand units.

Base Line

In order to measure anything, there must always be a starting point, or zero measurement. To express a direction as a unit of angular measure there must be a starting point, or zero measure,



187.95

Figure 15-21.—True, grid, and magnetic azimuths.

and a point of reference. These two points designate the base, or reference, line. There are three base lines—true north, magnetic north, and grid north. Those most commonly used are magnetic and grid; the magnetic when working with a compass, and the grid when working with a military map.

TRUE NORTH: This is a line from any position on the earth's surface to the North Pole. All lines of longitude are true north lines. True north is usually symbolized by a star (fig. 15-21).

MAGNETIC NORTH: The direction to the magnetic North Pole is indicated by the north-seeking needle of a magnetic instrument. Magnetic north is usually symbolized by a half arrowhead (fig. 15-21).

GRID NORTH: This is the north established by the vertical grid lines on the map. Grid north may be symbolized by the letters *GN* (fig. 15-21).

Topographic Map Symbols

The purpose of a topographic map is to permit you to visualize an area of the earth's surface with pertinent features properly positioned. Ideally, all features within an area would appear on the map in their true proportion, position, and shape. However, this is not practical. Many of the features would be unimportant and others could not be recognized because of their reduction in size. Therefore, the mapmaker has been forced to use symbols to represent these features. These symbols resemble, as closely as possible, the actual features themselves. (See figure 15-22.)

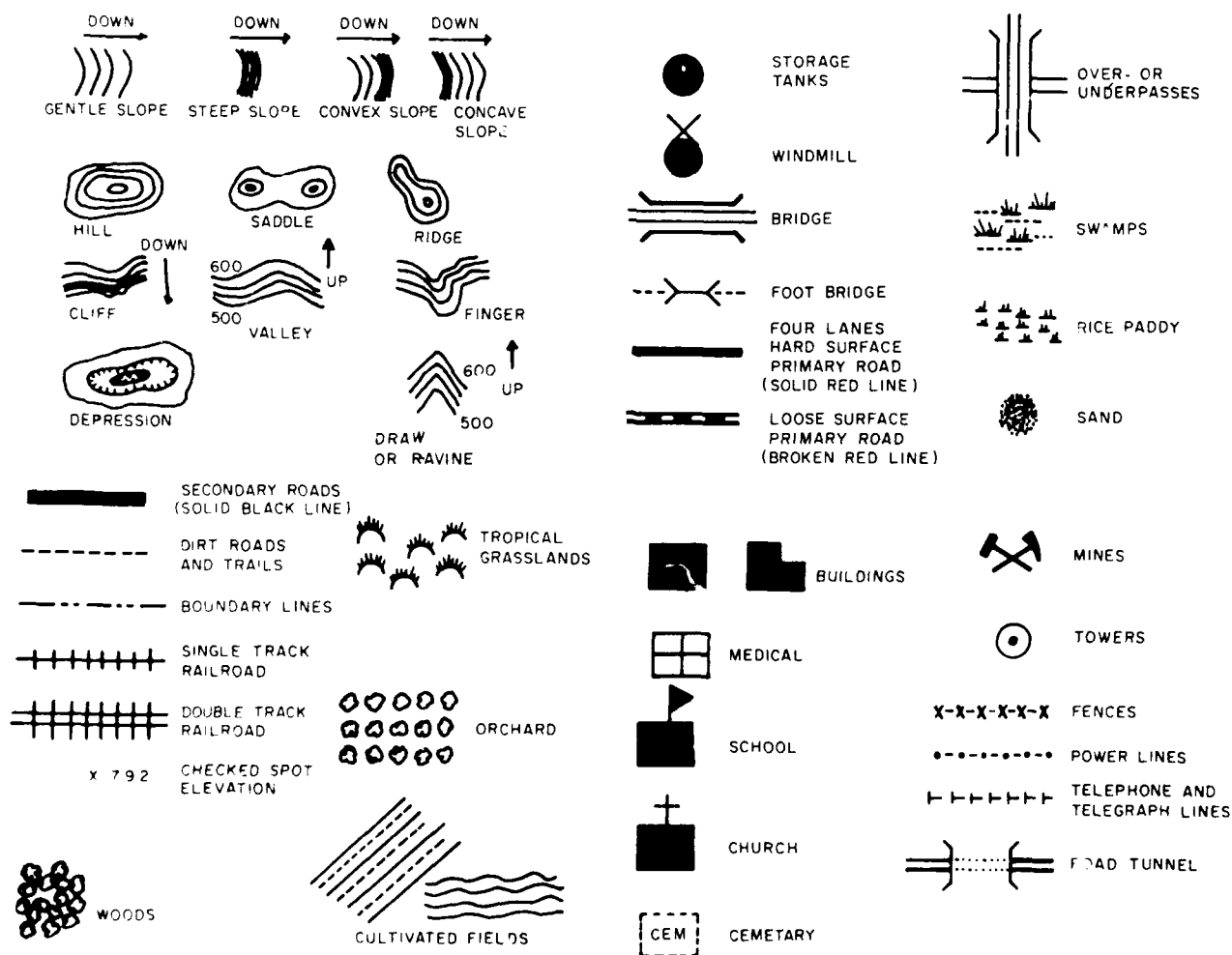


Figure 15-22.—Topographic symbols.

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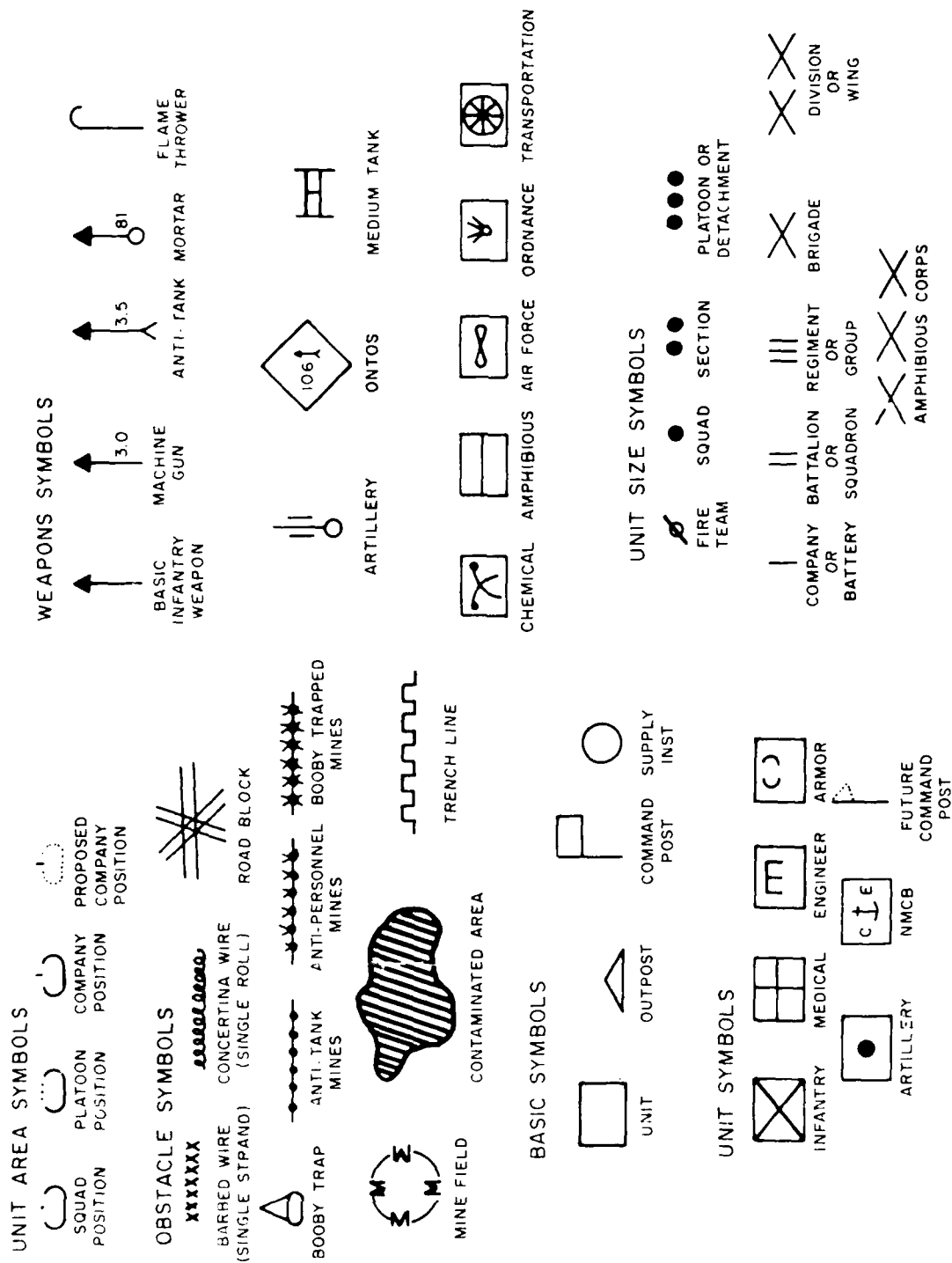


Figure 15-23.—Typical military symbols.

Topographic symbols are usually printed in a number of standardized colors. This is done so that the features on the map will be easier to identify and to give them a more natural appearance and contrast.

Black—the majority of cultural or man-made features

Blue—water features, such as lakes, rivers, and swamps

Green—vegetation, such as woods, orchards, or vineyards

Brown—all relief features, such as contours

Red—main roads, built up areas, and special features

Others—occasionally used to show special information; generally, explained in the marginal notes

Military Symbols

In addition to topographic symbols used to represent natural and man-made features of the earth, the military establishment requires some method for showing the identity, strength, locations, and movements of its troops, activities,

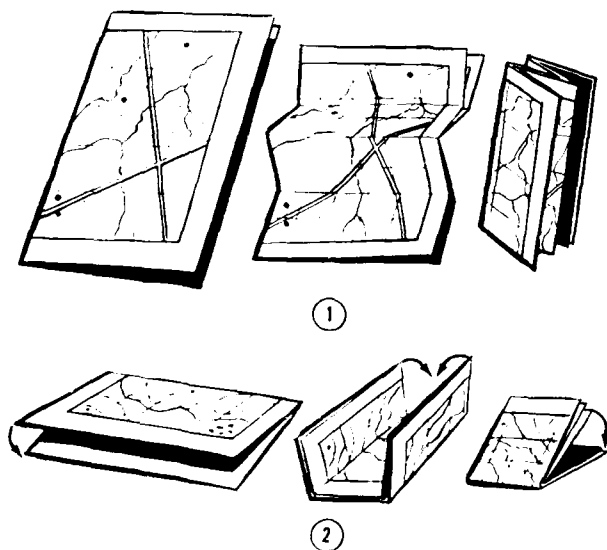
and installations. The symbols used to represent these features are known as military symbols. As these features are constantly changing and moving, they are not normally printed on the maps. They appear on special maps and overlays and are handled by following proper security precautions. Figure 15-23 illustrates many of these symbols.

Care of Maps

One of the first precautions in caring for maps is folding the map properly. Figures 15-24 and 15-25 show ways of folding maps to make them small enough to be carried easily and still be available for use without having to unfold them entirely.

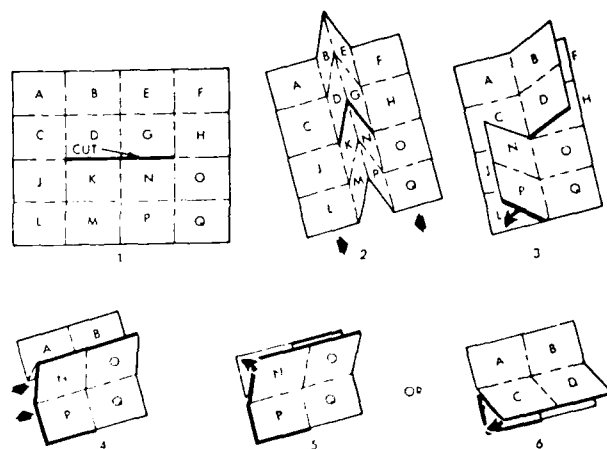
Your maps may have to last a long time, so protect them as best you can. Whenever possible, carry a map in a waterproof packet, in a pocket, under an outer garment, or other place where it is handy but still protected.

In marking a map, use light lines that may be erased easily without smearing, smudging, or leaving marks that may later tend to confuse someone. If you must trim the margins of a map for any reason, be careful to copy any marginal information that may be needed later, such as grid and magnetic declination data or overlapping grid values and ticks.



187.96

Figure 15-24.—Two methods of folding a map.



187.97

Figure 15-25.—How to slit and fold.

LENSATIC COMPASS

The lensatic compass is the most commonly used and simplest instrument for measuring directions and angles in the field. Two varieties of magnetic compasses are standard for military use today—the lensatic compass (fig. 15-26) and the artillery (M2) compass. Since the M2 is a special purpose compass, it will not be discussed in this chapter.

In order to use a map effectively in the field for purposes of identification, location, or reporting, the map must be oriented, or aligned, with the ground. A map is oriented when, in a horizontal position, its north points to the north and all map lines are parallel to their corresponding lines on the ground. A map user is oriented when he knows his position on the oriented map.

A fast and accurate way to orient a map is with a lensatic compass. If a compass rose (picture of a compass card) appears on the map, place the map on a flat surface and draw the magnetic north line. Open the compass and place it over the

magnetic north line so that the sight points toward the top of the map and is directly over the magnetic north line that you have drawn. Turn the map, taking care not to move the compass from its position over the north line, until the north arrow of the compass is aligned under the index line of the compass. The map is now oriented. For maps that do not have a compass rose, align the compass sights over a north-south grid line. Then rotate the map and compass together until the north arrow of the compass points in the same direction and amount from the grid line, shown in the declination diagram.

To orient a map when a compass is not available requires a careful examination of the map and the ground features of the area to find linear features that are common to both the map and the ground. Linear features are those that have length. Good examples are roads, railroads, fence lines, power lines, and so forth. By aligning the features on the map with the features on the ground, the map is oriented.

The lensatic compass must always be held level and firm when you are sighting on an objective

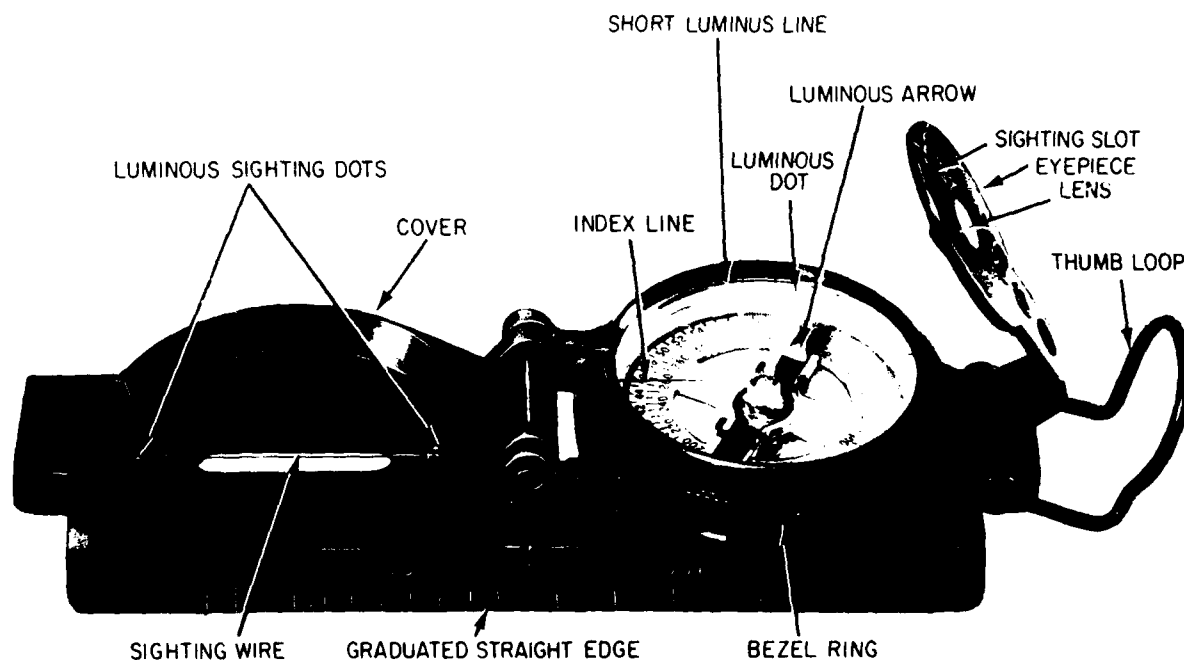


Figure 15-26.—Lensatic compass.

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and reading an azimuth (a horizontal angle measured in a clockwise manner from a north base line). There are several techniques for holding the compass and sighting, but we will discuss only two methods.

To sight an objective and read an azimuth with the first method, use the following steps:

1. Open the cover of the compass so it forms a right angle with the compass. Move the eyepiece so the compass dial is visible through the lens, as shown in figure 15-27.

2. Align the slot in the eyepiece with the hairline sighting wire in the cover and with the target.

3. Read the azimuth by glancing down at the dial through the lens.

This technique provides a reading precise enough to use for resection and intersection (to be discussed later in this chapter).

The second method has an advantage because it keeps the compass lower and farther away from the user's steel helmet; but it is less precise than the method just described.

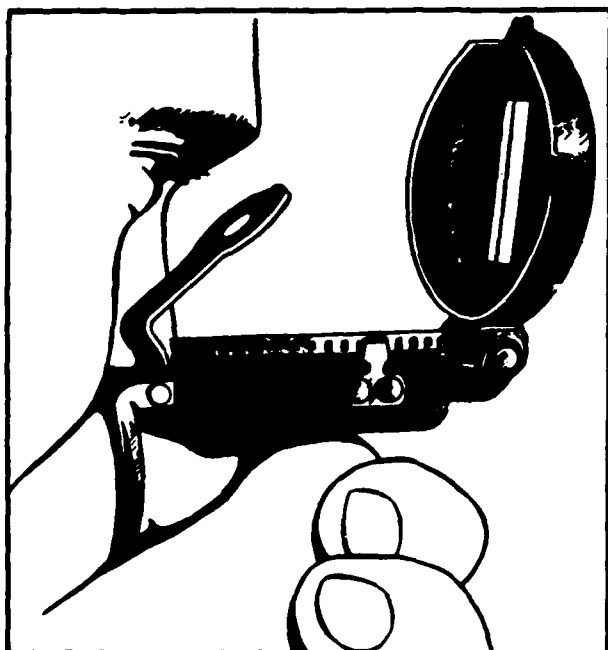


Figure 15-27.—A method of holding the compass.

To learn the second method, study the following steps:

1. Open the cover until it forms a straightedge with the compass base, as shown in figure 15-26.

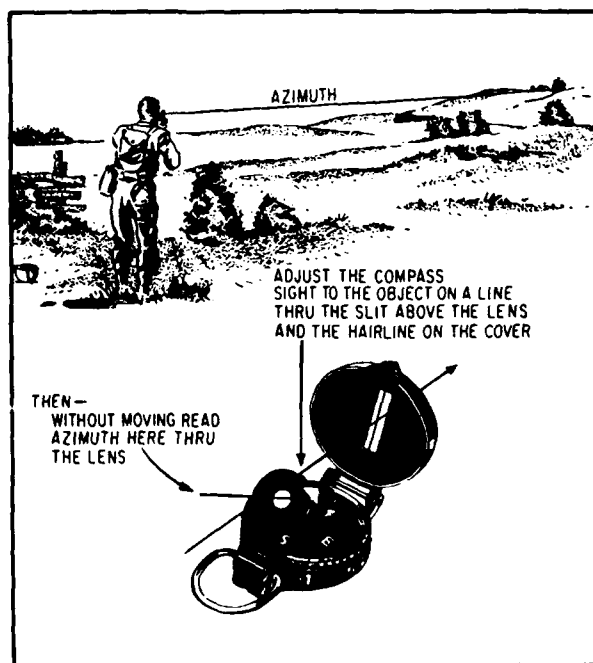
2. Pull the eyepiece as far to the rear as possible, perpendicular to the compass base.

3. Place your thumb through the thumb loop, forming a steady base with your third and fourth fingers, and extend your index finger along the side of the compass.

4. Extend the other index finger along the remaining side of the compass and place the remaining fingers around the fingers of the other hand.

5. Pull your elbows firmly into your sides. This will place the compass between your chin and your belt.

6. To take an azimuth reading, simply turn your entire body toward the object, pointing the compass cover directly at the object. See figure 15-28.



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Figure 15-28.—Method of determining the azimuth of a visible object.

SEABEE COMBAT HANDBOOK

7. Then, just look down and read the azimuth from beneath the fixed, black index line.

For night use, special features of the compass are the luminous markings and the 3° bezel serration and clicking device. Turning the bezel ring to the left causes an increase in azimuth, while turning it to the right causes a decrease. The bezel has a stop and spring that allows clockwise and counterclockwise turns at 3° intervals per click and holds the bezel ring in any desired position. One method for determining compass directions at night is as follows:

1. Rotate the bezel until the luminous line is over the black index line.

2. Hold the compass with the left hand and continue to rotate the bezel ring with the right hand in a counterclockwise direction for the number of clicks required. The number of clicks is determined by dividing the value of the required azimuth by 3. For example, for an azimuth of 51°, the bezel ring would be rotated 17 clicks counterclockwise.

3. Turn the compass until the north arrow is directly under the luminous line on the bezel.

4. Hold the compass open and level in the palm of the left hand with the thumb along the flat side of the compass. In this manner, the compass can be held consistently in the same position. Position the compass approximately halfway between the chin and the belt, pointing directly ahead of yourself. A little practice in daylight will make you proficient in pointing the compass the same way every time. Looking directly down into the compass, turn your body until the north arrow is under the luminous line. Then move forward in the direction of the front cover luminous sighting dots (fig. 15-26).

Certain precautions about the care and use of a lensatic compass are important because they assure, within reason, that a compass will work when and where you need it.

1. Handle the compass with care. The dial is set at such a delicate balance that a shock could damage the compass.

2. Close and return the compass to its special container when it is not in use. In this way, it is not only protected from possible damage but is readily available for use when needed.

3. When the compass is to be used in darkness, an initial azimuth should be set, if possible, while light is still available. With this initial azimuth as a base, you can read any other azimuth that is a multiple of 3° by using the clicking feature of the bezel.

4. Compass readings should NEVER be taken near visible masses of iron or electrical circuits. The following are suggested as approximate safe distances to ensure proper functioning of the compass:

High tension power lines	55 yards
Field gun, truck, or tank	18 yards
Telegraph and telephone wires and barbed wire	10 yards
Machine gun	2 yards
Helmet or rifle	0.5 yards

Nonmagnetic metals and alloys do not affect compass readings.

5. Practice using the compass at regular intervals to be sure you are competent in its use in an emergency.

Azimuth and Back Azimuth

The most common military method of expressing a direction is by using azimuths. As stated before, an AZIMUTH is defined as a horizontal angle, measured in a clockwise manner from a north base line. When the azimuth between two points on a map is desired, the points are joined by a straight line. Then a protractor is used to measure the angle between grid north and the drawn line. This measured angle is the grid azimuth of the drawn line (fig. 15-29). When using an azimuth, you imagine the point from which the azimuth originates is the center of the azimuth circle (fig. 15-30). Azimuths take their name from

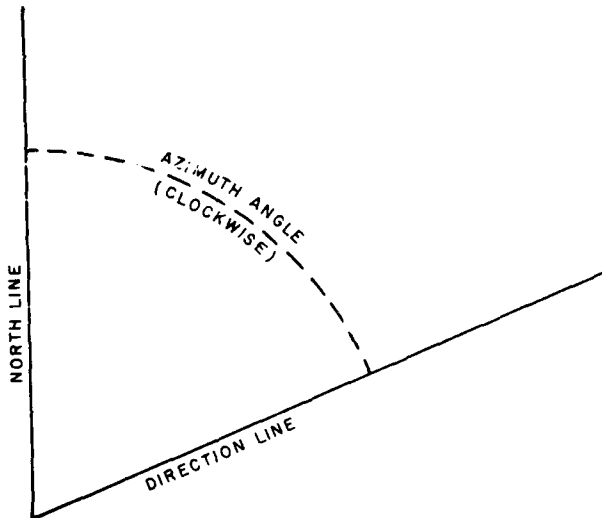


Figure 15-29.—Azimuth angle.

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the base line from which they have been measured; true azimuths from true north, magnetic azimuths from magnetic north, and grid azimuths from grid north (fig. 15-21). Therefore, any one given direction can be expressed in three different ways: a grid azimuth, if measured on a military map; a magnetic azimuth, if measured by a compass; or a true azimuth, if measured from a meridian of longitude.

The BACK AZIMUTH of a line is its forward azimuth plus 180° ; or if this sum is greater than 360° , the back azimuth is the forward azimuth minus 180° . For example, if the forward azimuth of a line is 112° , (fig. 15-31), the back azimuth is

$$112^\circ + 180^\circ = 292^\circ.$$

If the forward azimuth of a line is 310° , the back azimuth is

$$310^\circ - 180^\circ = 130^\circ.$$

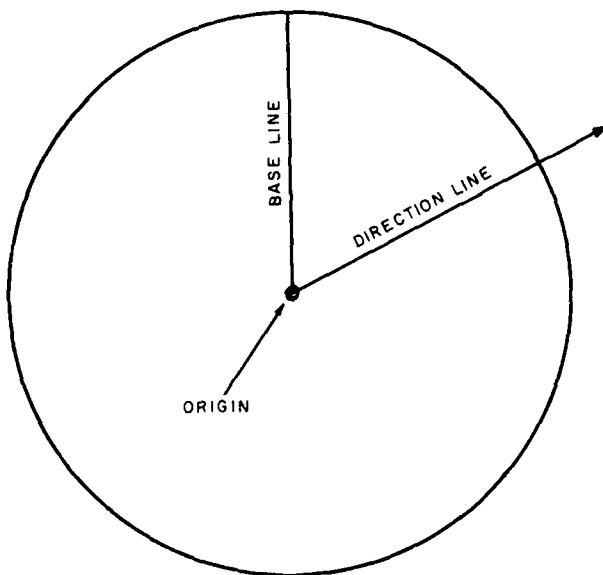
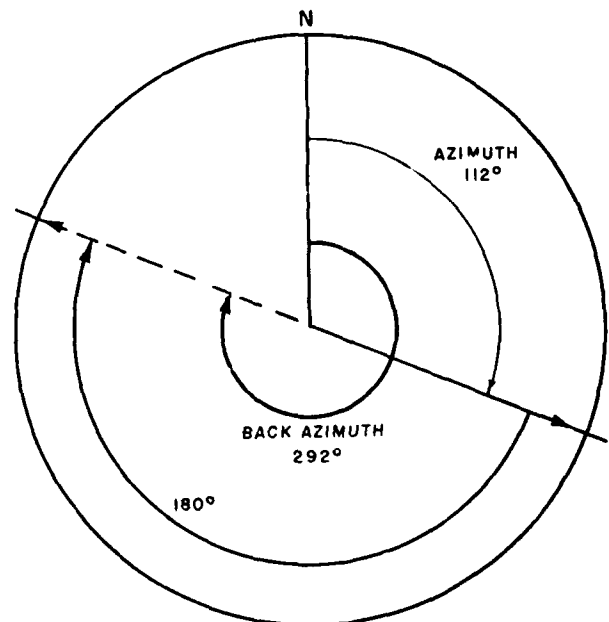


Figure 15-30.—Origin of azimuth circle.

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AZIMUTH = CLOCKWISE ANGLE FROM BASE DIRECTION
BACK AZIMUTH = AZIMUTH + 180° OR 3200 MILS.

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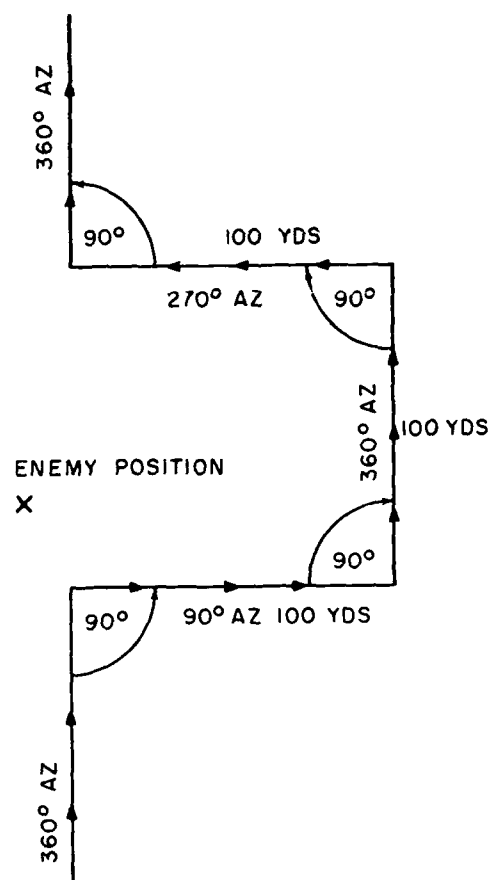
Figure 15-31.—Azimuth and back azimuth.

Figure 15-32 shows an example of how to bypass enemy positions or obstacles by detouring around them. This allows you to stay oriented by moving at right angles for specified distances. For example, if you are moving on an azimuth of 360° and wish to bypass an obstacle or position, you change direction to 90° and travel for 100 yards; change direction back to 360° and travel for 100 yards; change direction to 270° and travel for 100 yards; then change direction to 360° ; and you are back on your original azimuth.

Bypassing an unexpected obstacle at night is a fairly simple matter. To make a 90° turn to the right, hold the compass as described earlier in the method for night use; turn until the center of the luminous letter *E* is under the luminous line (do not change the setting of the luminous line). To make a 90° turn to the left, turn until the center of the luminous letter *W* is under the luminous line. The compass setting (bezel ring) does not require changing, and you can be sure of accurate 90° turns. For example, you decide to detour to the right. You turn until *E* is under the luminous line and move ahead in that direction until you have outflanked the obstacle. You then turn until the north arrow is under the luminous line and move parallel to your original course until you have bypassed the obstacle. You then turn again until the *W* is under the luminous line and move back the same distance you originally moved out. Finally, you turn until the north arrow is under the luminous line and go ahead on your original course. This method works regardless of what your initial azimuth may be.

Protractor

Protractors come in several forms—full circle, half circle, square, and rectangular (fig. 15-33). All of them divide a circle into units of angular measure; and regardless of their shape, then they consist of a scale around the outer edge and an



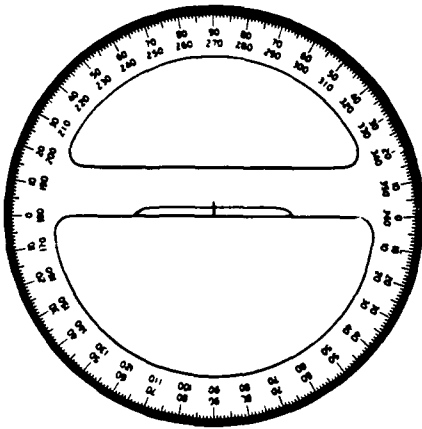
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Figure 15-32.—Detour around enemy positions or obstacles.

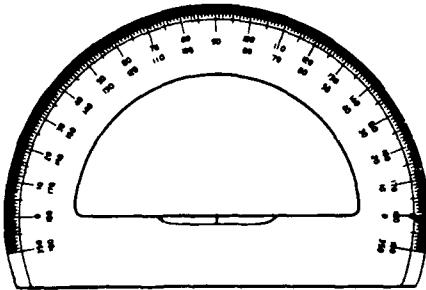
index mark. The INDEX MARK is the center of the protractor circle from which all the direction lines radiate.

To determine the grid azimuth of a line from one point to another on the map (from A to B or C to D) refer to figure 15-34 as you study the following:

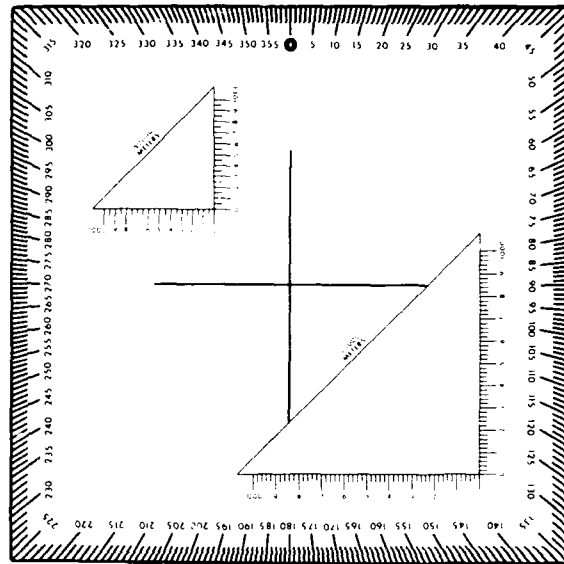
1. Draw a line connecting the two points.
2. Place the index of the protractor at the point where the line crosses a vertical (north-south) grid line.
3. Keeping the index at this point, align the $0^\circ - 180^\circ$ line of the protractor on the vertical grid line.



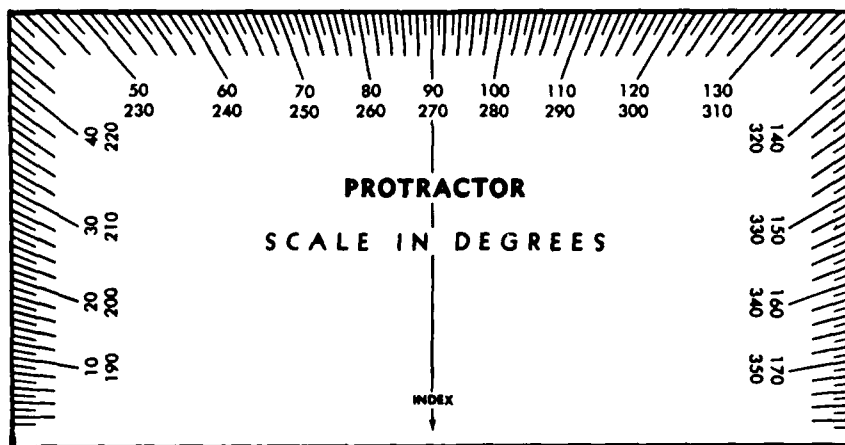
CIRCULAR



SEMICIRCULAR



SQUARE



RECTANGULAR

Figure 15-33.—Types of protractors.

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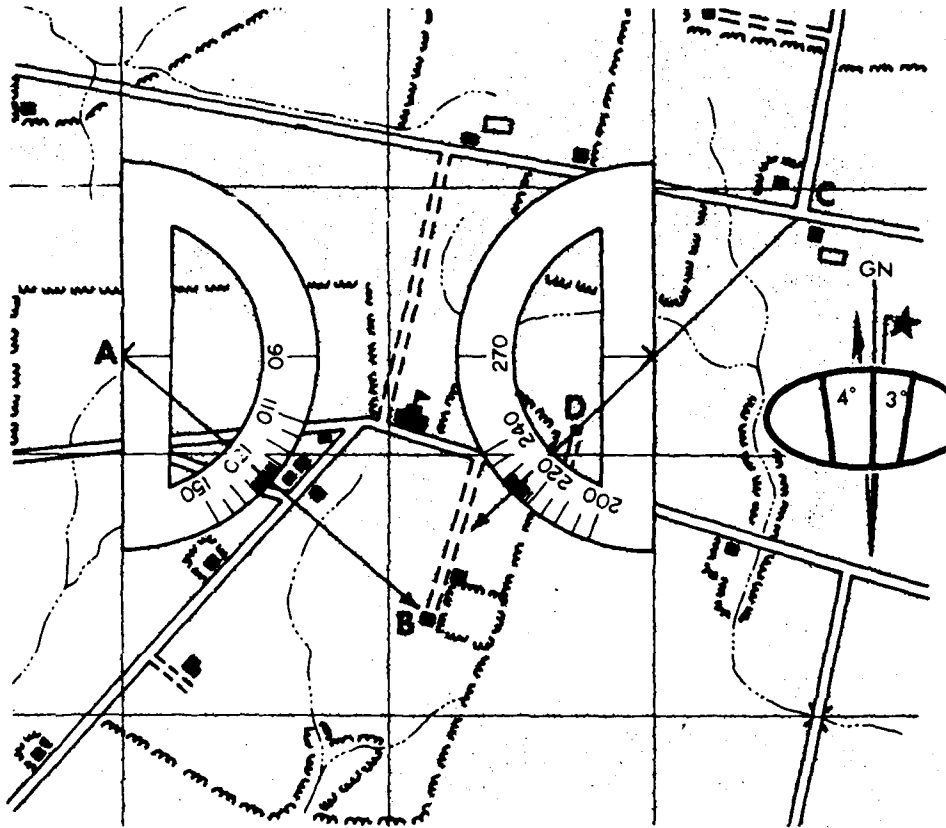


Figure 15-34.—Measuring an azimuth on a map.

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4. Read the value of the angle from the scale; this is the grid azimuth of the point.

To plot a direction line from a known point on a map, refer to figure 15-35 as you study the following:

1. Convert, if necessary, the direction to a grid azimuth.

2. Construct a north-south grid line through the known point. Then proceed in the following steps:

- First, approximately align the $0^{\circ} - 180^{\circ}$ line of the protractor in a north-south direction through the known point.

- Second, holding the $0^{\circ} - 180^{\circ}$ line of the protractor on the known point, slide the

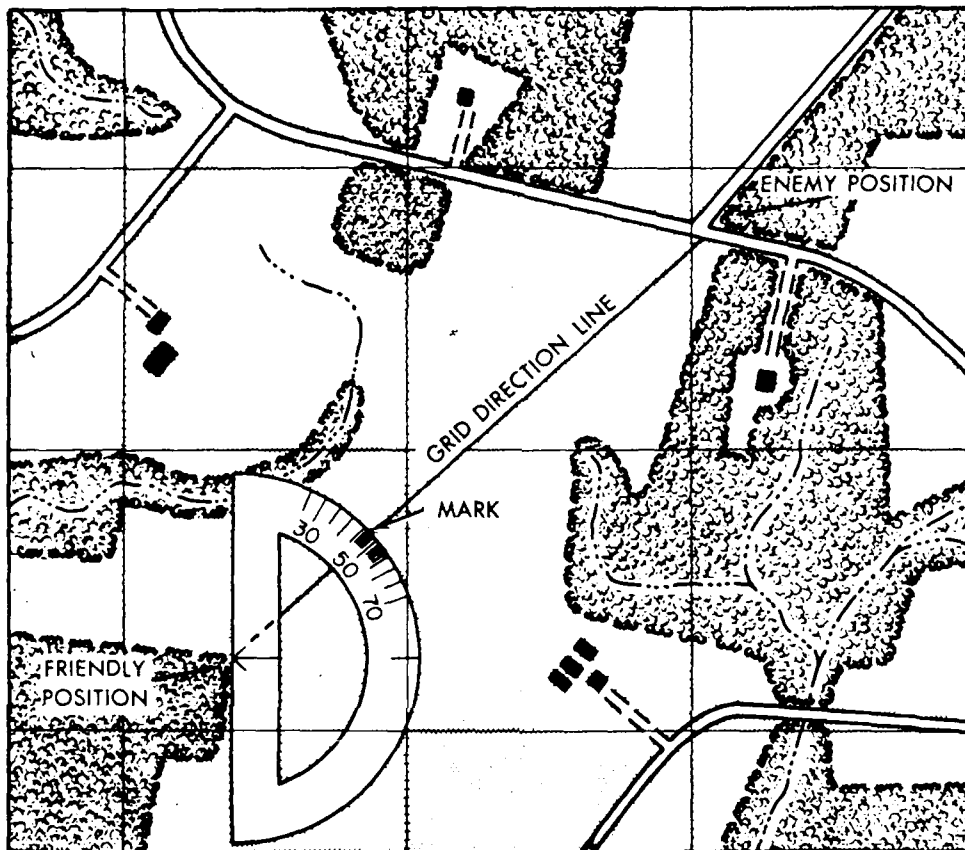
protractor in the north-south direction. Slide it until the horizontal line of the protractor (connecting the protractor index and the 90° tick mark) is aligned on an east-west grid line.

- Draw a line connecting 0° , the known point, and 180° .

- Holding the $0^{\circ} - 180^{\circ}$ line coincident with this line, slide the protractor index to the known point.

- Make a mark on the map at the required angle.

- Draw a line from the known point through the mark made on the map. This is the GRID DIRECTION line.



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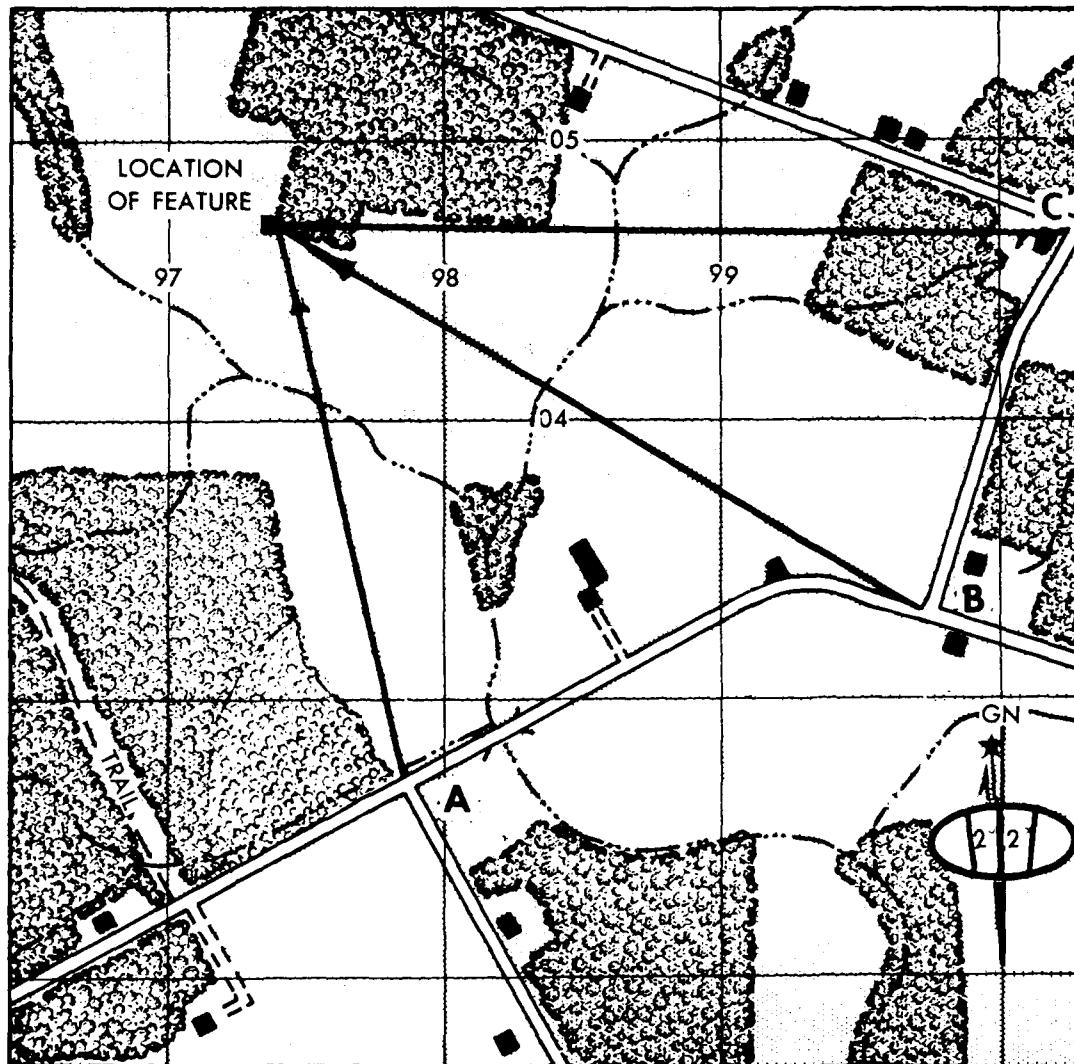
Figure 15-35.—Plotting an azimuth on a map.

Intersection

Locating an unknown point by successively occupying at least two, but preferably three, known positions and sighting on the unknown point is called intersection. It is used to locate features that are not defined on the map or which are not readily identifiable. The two methods of intersection are the map and compass method and the straightedge method.

MAP AND COMPASS METHOD.—Study the following steps to locate an unknown point using the map and compass method of intersection. (See fig. 15-36.)

1. Orient the map using the compass.
2. Locate and mark your position (point A) on the map.
3. Measure the magnetic azimuth to the unknown position; convert it to grid azimuth.
4. Draw a line on the map from your position on this grid azimuth.
5. Move to a second known position (point B) from which the unknown point is visible. Locate this position on the map and again orient the map using the compass.
6. Repeat steps 3 and 4 above.
7. As a check on accuracy, move to a third position (point C) and repeat steps 1 through 4 above.
8. The point where the lines cross is the location of the unknown position. Using three



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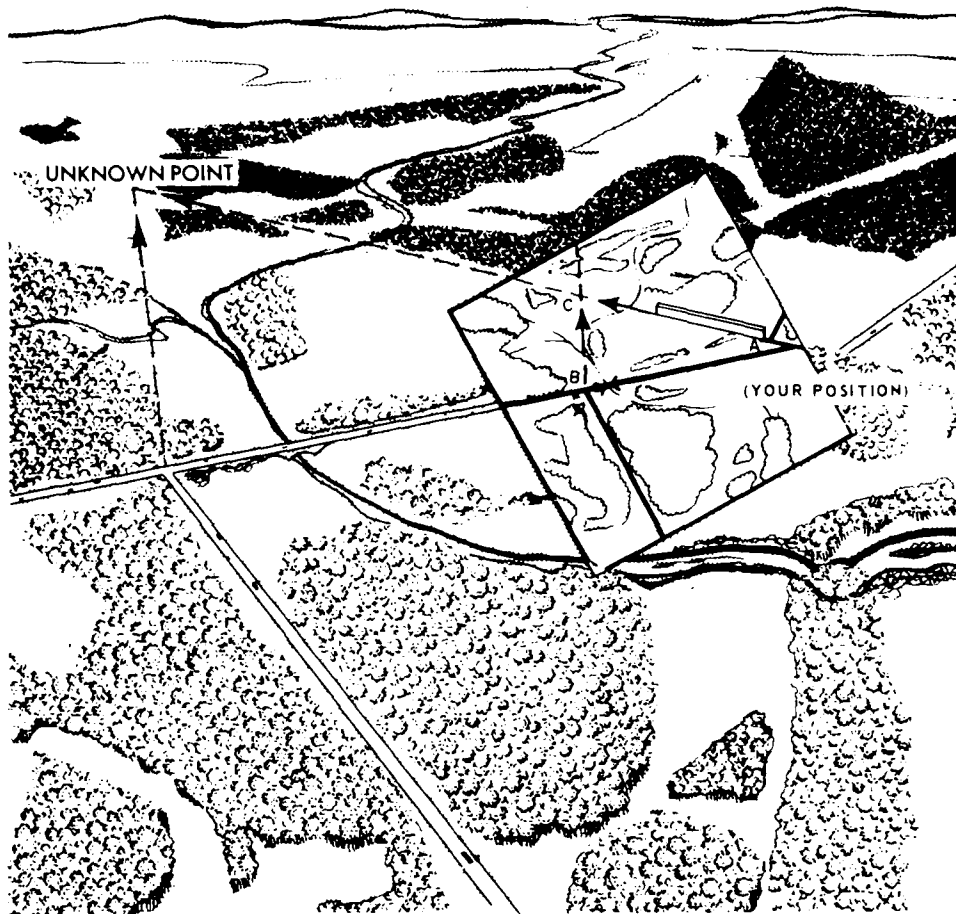
Figure 15-36.—Intersection using map and compass.

lines, you sometimes form a triangle instead of an intersection. This is called the **TRIANGLE OF ERROR**. If the triangle is large, recheck your work to find the error. Do not assume that the position is at the center of the triangle.

STRAIGHTEDGE METHOD (WHEN NO COMPASS IS AVAILABLE).—Study the following steps to locate an unknown point

using the straightedge method of intersection. (See fig. 15-37.)

1. Orient the map on a flat surface by the inspection method.
2. Locate and mark your position on the map.
3. Lay a straightedge on the map and place one end at the user's position (point A) as a pivot point. Then rotate the straightedge until the unknown point is sighted along the edge.



187.103

Figure 15-37.—Intersection without compass.

4. Draw a line along the straightedge.
5. Repeat the above procedures at point B, and for a check on accuracy, at a third position.
6. The intersection of the lines is the location of unknown point C.

Resection

Locating the user's unknown position by sighting on two or three known features is called resection (fig. 15-38). Resection can be done with or without a compass.

MAP AND COMPASS METHOD.—Study the following steps to locate the user's unknown position by the map and compass method.

1. Orient the map using the compass.
2. Locate two or three known positions on the ground and mark them on the map.
3. Measure the magnetic azimuth to a known position; convert to grid azimuth.
4. Change the grid azimuth to a back azimuth and draw a line on the map from the known position back toward your unknown position.
5. Repeat steps 3 and 4 above for a second known position.

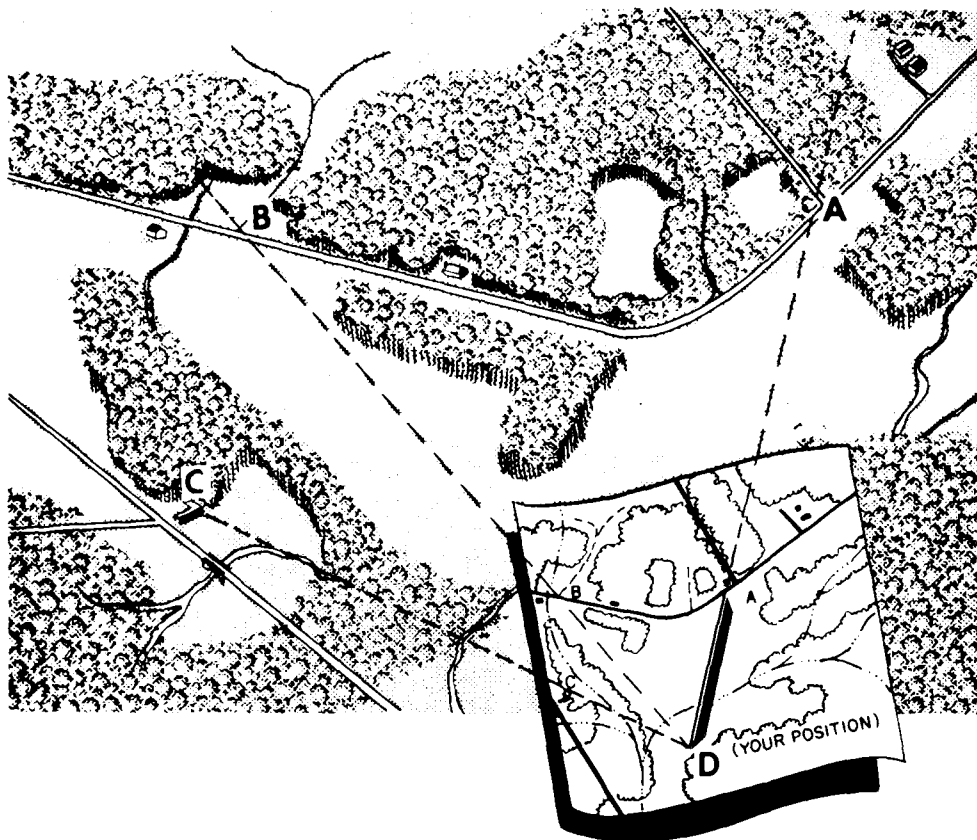


Figure 15-38.—Resection.

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6. For a check on your accuracy, repeat steps 3 and 4 above for a third known position.

7. The intersection of the lines is your location. Using three lines, a triangle of error may be formed. If the triangle is large, recheck your work.

STRAIGHTEDGE METHOD.—Study the following steps to locate the user's unknown position by the straightedge method.

1. Orient the map on a flat surface by the inspection method.

2. Locate two or three known positions on the ground and mark them on the map.

3. Lay a straightedge on the map with the center of the straightedge at a known position as a pivot point. Rotate the straightedge until the

known position on the map is aligned with the known position on the ground.

4. Draw a line along the straightedge away from the known position on the ground toward your position.

5. Repeat step 3 above using a second known position; and as a check on your accuracy, repeat step 3 above, using a third known position.

6. The intersection of the lines is your location.

SKETCHES AND OVERLAYS

You are not expected to be a draftsman. But you should be able, if necessary, to make rough drawings of maps, field sketches, and overlays. The instruction presented in this chapter about

maps will assist you in making rough drawings of them. *The information below will be useful in preparing a rough drawing of a field sketch or map overlay.*

The two kinds of sketches are panoramic and topographic.

PANORAMIC SKETCHES

A panoramic sketch is a picture of the ground or terrain. It shows the height and view from your point of observation. A panoramic sketch prepared by one scout may assist another scout in finding himself in a brief time in the same location.

To make a panoramic sketch, use the following guidance:

1. First, determine the information you desire to convey.
2. Next, draw in the landscape lines that are more or less horizontal.
3. Show the main points of the area on the sketch. Do not put in any unimportant details that might only be confusing, and do not show the foreground. Be sure you show the location of the information you are conveying.
4. Place any explanatory notes above the sketch with arrows pointing to the features explained.
5. The most prominent point in the sketch should be used as a reference point. After selecting this point, indicate the azimuth reading used to locate it.
6. Place a title on the sketch, show where it was prepared, indicate the date, and time it was made; then sign it.

TOPOGRAPHIC SKETCHES

A topographic sketch is prepared so that the person receiving it can plot on a map your

scouting position or the information you wish to convey. To prepare a topographic sketch, you need a map similar to one your commander has in his possession.

1. Read the azimuth from your position to the position of an object you can easily see and describe.
2. Estimate the distance, using the most accurate means available.
3. Draw the azimuth line from you to the object. Then mark the azimuth above this line and the distance below the line.
4. At the proper end of the line, indicate the object. At the other end of the line, indicate your own position.
5. Find the azimuth and the distance to some other point on the map or to the position of the command post.
6. Draw this line on the sketch. Then indicate the azimuth, the distance, and the object to which it is drawn.
7. Finally, sign the sketch.

MAP OVERLAYS

A map overlay is generally used to send back reconnaissance information. The overlay is made by placing a piece of transparent paper on a map, marking the location and numbering the corners of the grid squares. At least two corners should be marked or creased. These crosses are called **REGISTER MARKS** and are used to orient the overlay on a map later on. After the register marks have been made, you only need to write the information that is to be sent back to the command post. When the overlay is received, it will be placed on a similar map and oriented by its register marks and the information you recorded.

CHAPTER 16

EVASION, SURVIVAL, AND ESCAPE

The tactical need for greater individual and unit dispersion in warfare increases the possibility that your unit may be temporarily isolated from friendly forces. Experience shows this temporary isolation is fairly common and normal in both conventional warfare and counterinsurgency operations. For example: Enemy action may cause relocation of adjacent units so that you lose immediate contact with friendly forces; a sudden massing of guerrilla forces may isolate your unit in a guerrilla-controlled area; or as a member of a patrol operating in an enemy area, you may become separated from your patrol and find yourself alone or with a small group. If you do become isolated, you and your group or unit must still try to accomplish your assigned mission. After completing your mission, your primary task is to rejoin friendly forces.

If you are isolated in an enemy area, your major problems will be (1) avoiding the enemy (EVASION), (2) the possibility of living in the field with limited equipment (SURVIVAL) until you can return to friendly forces, and (3) the problem of escaping from the enemy if captured (ESCAPE).

This chapter contains information on the principles and techniques of evasion, survival, and escape that have been used successfully worldwide. The information given here is by no means all-inclusive, but it should serve as an aid if the need arises.

EVASION

Obviously, the most important consideration in evasion is knowing the location of the enemy. If you do not know where the enemy is located when you become separated from your unit, some

of the more obvious signs to help you determine this are the following:

- Signs of the passage of groups, such as crushed grass, broken branches, footprints, cigarette butts, or other discarded trash. These may reveal the identity, size, direction of travel, and time of passage of the people.

- Workers in fields may indicate the absence of the enemy.

- Apparently normal activities in villages may indicate absence of the enemy.

Less obvious signs are conditions that are considered negative information, for example:

- The absence of workers in fields is an indication that the enemy is near.

- The absence of children in a village is an indication that they have been hidden to protect them from action that may be about to take place.

- The absence of young men in a village is an indication that the village is controlled by the enemy.

No identifiable specific techniques are involved in evasion, but you will need to use all other phases of your combat training. You will use cover, concealment, camouflage materials, day and night movement techniques, maintaining direction, security, passing of obstacles, silent weapons, health measures, physical conditioning, and patrolling. These are all basic to evasion as well as to survival and to escape.

SEABEE COMBAT HANDBOOK

You must know the following:

1. How to conceal yourself when the enemy is near and to move without silhouetting yourself against the skyline; how to keep from being spotted from enemy aircraft.
2. How far noises carry in fog, falling snow, heavy foliage, or over rocky surfaces.
3. How smells from food being cooked, tobacco and wood smoke, body odors, and body wastes can reveal your location.
4. The dangers of sudden, rapid movement.
5. How to observe the enemy without being observed.
6. How to camouflage yourself, your camp, and equipment as well as the dangers of using too much camouflage.
7. How to select routes for movement that avoid exposed areas; how to move quietly without leaving obvious tracks; and how to determine travel time for yourself or for a group.
8. How to signal using your voice, hands and arms, pebbles, and pieces of wood.

EVASION TRAVEL

The route that you select to travel while trying to evade the enemy depends upon the situation in which you find yourself, the weather conditions, and the nature of the terrain. Whether you select a ridge, stream, valley, coastline, dense forest, or mountain range to follow, be sure it is the safest rather than the easiest way. Experience has proved that the most difficult route is frequently the safest.

A route along a ridge line is usually easier to follow than one through a valley. Game trails are frequently on top of ridges, and you can use them to guide your travel. Also you find less vegetation, frequent high points for observing landmarks, and few streams and swamps to ford.

The use of a stream as a route is of particular advantage in strange country because it provides a fairly definite course and might lead to populated areas; also, the stream may provide you with fish and water and serve as a vehicle for travel by boat or raft. However, be prepared to ford, detour, or cut your way through the thick vegetation lining the stream. If you are following a stream in mountainous country, watch for falls, cliffs, and tributaries as check points. In flat

country, streams usually meander, are bordered by swamps, and are thick with undergrowth. Travel on these streams provides little opportunity to observe landmarks.

If you decide to follow a coastline, you can figure on a long, roundabout route. But it will be a good starting point, an excellent baseline from which to get your bearings, and a probable source of food.

In strange country, study outstanding terrain features as you travel, and concentrate on keeping your course. Climb to a high point and look at the general pattern of the land, character of the vegetation, the drainage patterns, and the trend of mountains and ridges. Choose a prominent landmark that you can see while you travel. As you near this landmark, line up another one ahead of you.

If you are traveling in a dense forest, you probably won't be able to spot distant landmarks. You can hold a course by lining up on two trees forward of your position in your direction of travel. As soon as you pass the first one, line up another beyond the second. You might find it helpful to look back occasionally to check the relative positions of landmarks or ground slope and contour.

You can usually use streams, ridges, and trees as guides in open country and as a means of retracing your route. On overcast days, in areas where the vegetation is dense, or whenever the country appears the same, mark your route. Use bent bushes, rocks, or notches placed on the back sides of trees at approximately eye level. Mark bushes by cutting vegetation or bending it so that the under and lighter side of the leaves are facing upward. These signs are especially conspicuous in dense vegetation. But use them with discretion because you risk discovery by the enemy when you mark your route too plainly.

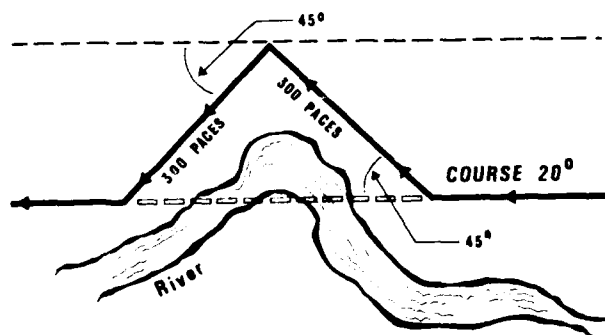
Even if you have a map, don't guide too confidently on man-made features or landmarks that are likely to change. The only safe landmarks are natural features, such as rivers and hills. In the jungle, for example, when a village site marked on a map is investigated, it will often be an overgrown clearing. Similarly, one rainy season can change the course of a small stream or close an unused trail with dense shrub.

Use trails as guides that lead in the general direction of friendly forces; and when you come

to a fork, use the path that appears most traveled as a guide. If you guide on the wrong trail and find yourself lost, stop and try to remember the last time that you were sure of your location. Mark your location where you were lost and start backtracking. Sooner or later you will discover a recognizable feature with which you can pinpoint your position.

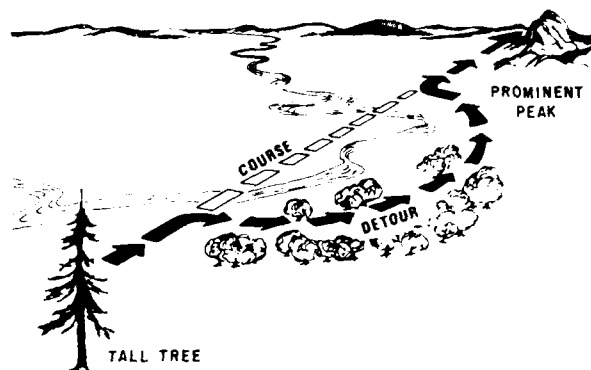
Traveling at night is safe in the desert or open country but not advisable in strange, wooded country. However, if you do travel at night, use a shielded light only when necessary to find your way over rough, dangerous spots or to read a map or compass. Since your eyes adjust to the darkness, a light blinds you to all but a small area that is illuminated. You can keep a fairly accurate course for short distances in open country by picking a bright star near the horizon as a guide star in your line of travel. Then line up the trees and other skyline landmarks ahead with the star. Be sure you check your direction frequently with the North Star or the Southern Cross and change your guide star when you need to change direction.

You might have to detour frequently in rough country. To do this, you might try to follow methods, such as the one illustrated in figure 16-1. This method is used for estimating distance and average angle of departure for short detours. On your return from the detour, you estimate the angle and distance to regain your original line of travel. For greater accuracy, count paces and use a compass. Another method, shown



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Figure 16-1.—Estimating distance and average angle of departure.



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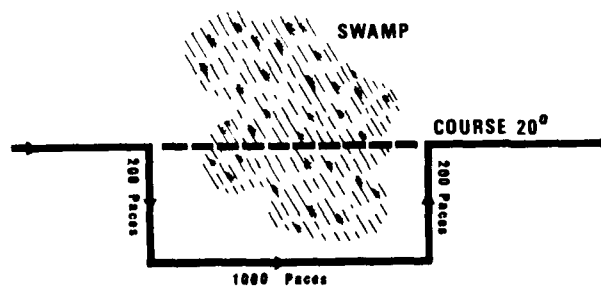
Figure 16-2.—Using a prominent landmark.

in figure 16-2, allows you to select a prominent landmark ahead and behind your line of travel. On returning from your detour, walk until you are again "lined up" on the two landmarks; then follow your original course. Another example for detouring is by compensating by paces and right angles, as shown in figure 16-3.

TRAVEL TIPS FOR EVASION

Be patient and cautious and avoid overconfidence. An enemy approach is no cause for panic. Normally, the chances of remaining unobserved are good.

Conserve your strength by avoiding exhaustion. When you are compelled to remain in one place for an extended period, exercise moderately in order to keep fit.



187.52

Figure 16-3.—Compensating by paces and right angles.

SEABEE COMBAT HANDBOOK

Generally, avoid eating uncooked food or drinking unboiled water. Select a hiding place and cook the food and boil the water to be used en route to the next evasion objective.

Retain items of personal clothing and equipment that will serve a useful purpose during evasion. Keep some item that will identify you as a serviceman, such as your dog tags. If you are not able to identify yourself as a serviceman, you may be treated as a spy, if captured. You may also be refused assistance by escape organizations or friendly locals.

Do not leave or throw away any articles that, if found, would reveal your presence or that you had been at a certain point. Bury or otherwise dispose of the effects of your campsite, that could give the enemy a clear picture of your direction of travel.

Practice supply economy. The same jacket or pair of shoes may have to be used throughout the entire evasion trip. This may cover hundreds of cross-country miles during both winter and summer seasons. Build up your food and water supplies and carefully ration them so they will last until you can reach an evasion objective or replenish them or both.

Use firearms only in an emergency and keep them concealed at all times during your evasion, unless a situation arises that requires a show of arms.

Avoid people as long as possible. However, if you find that you can no longer hope to go ahead on your own because of sickness, lack of food, or other compelling reasons; then, and only then, should you seek help from the local populace. Assistance may come from individual locals who are sympathetic to the allied cause or from members of the underground who operate escape lines for the purpose of returning evaders to friendly forces. You must be wary when contacting locals regardless of what they claim to be. If you are fortunate enough to travel through an area where an organized escape line exists, the chances are good that a spotter will seek you out. Spotters for resistance or underground organizations are particularly alert when they have reason to believe that friendly forces are in their area. But this will also apply to the enemy police and counterintelligence agents. Persons wearing civilian clothing in enemy-held territory are not

necessarily civilians; many enemy soldiers have been found disguised as civilians.

CRUCIAL PHASE OF EVASION

Establishing contact with friendly lines or crossing the border to a neutral country is the most crucial point of evasion. All of your patience, planning, and hardships will have been in vain if you are not wary when contacting friendly frontline forces. Many personnel operating behind enemy lines have been killed by friendly outposts while attempting to pass through friendly lines. Evaders have been shot by friendly patrols because they did not identify themselves properly. Many refugees have been accidentally killed by friendly forces. While trying to escape to freedom, most of these refugees would not have been shot if they had used caution and followed a few simple rules. The normal tendency is to throw caution to the wind when you are in sight of friendly forces. Realize that the situation is very sensitive, and this tendency should be overcome.

Regular patrols or special mission personnel operating behind enemy lines are given the challenge and password of the day as a security measure. This provides for the identification of the patrol as it approaches a friendly position. In addition, frontline troops are told the time and place where patrols will leave and enter the lines. The password of the day will not help you unless you are able to rejoin your outfit within 24 hours after your separation from your unit. You must follow certain established procedures and hope the frontline troops will also follow them. Frontline troops (especially those employed several miles forward of the battle area) usually shoot first and ask questions later. It is obvious that contact with these troops is, at the least, sensitive and a calculated risk. However, in the absence of an opportunity to contact a friendly patrol, this may be the only alternative. Generally, frontline troops are told that the display of a white flag or another white object should be honored and that the unknown person be allowed to advance to be recognized.

Once back in friendly hands, it is very natural to want to talk about your exploits. And you will undoubtedly be asked countless questions by frontline troops. This is the time for you to remain silent because if you talk at this point, you may

endanger the lives of those who helped you. In addition, your answers may compromise the methods used to evade the enemy that could be used by some other unfortunate serviceman in evading safely. You are authorized to give only information of immediate tactical importance to frontline units, unless you are a member of regular patrol actions. Advise the first officer or petty officer you contact that you are returning to duty from missing in action, prisoner of war, or internment status; then request to be taken to someone authorized to receive evasion and escape information.

SURVIVAL

The experience of hundreds of servicemen isolated during World War II, the Korean conflict, and the Vietnam conflict proved that survival is largely a matter of mental outlook. The will to survive is the deciding factor. Whether with a group or alone, you will experience emotional problems *resulting from fear, despair, loneliness, and boredom*. Also, your will to live is sure to be taxed by injury and pain, fatigue, hunger, and thirst. If you are not prepared mentally to overcome all obstacles and accept the worst, your chances of coming out alive are greatly reduced.

INDIVIDUAL SURVIVAL

The shock of finding yourself isolated behind the enemy lines, in a desolate area, or in enemy hands can be reduced or even avoided if you remember the meaning of the letters in the keyword S-U-R-V-I-V-A-L (fig. 16-4).

- **S**—Size up the situation by considering yourself, the country, and the enemy.

When you think about yourself, hope for the best, but be prepared for the worst. Recall your survival training and expect it to work. After all, you have been through this before—the only difference is that this is the real thing. If you think this way, you will increase your chances for success by being confident that you can survive. Get to a safe, comfortable place as quickly as possible. Once you find a safe place, look things over, think, and form a plan. Your fear will

Size up the situation

Undue haste makes waste

Remember where you are

Vanquish fear and panic

Improvise

Value living

Act like the natives

Learn basic skills

187.29

Figure 16-4.—Factors for survival.

lessen; your confidence will increase. Be calm. Take it easy until you know where you are and where you are going.

Part of your fear may come from being in a strange country; therefore, try to determine where you are by landmarks, compass directions, or by recalling intelligence information passed on to you by your leaders.

When you think about the enemy, put yourself in the enemy's shoes. What would you do? Watch the enemy's habits and routines. Base your plan on your observations. Remember, you know where the enemy is, but he does not know where you are.

- **U**—Undue haste makes waste.

Don't be too eager to move. It will make you careless and impatient. You begin to take

SEABEE COMBAT HANDBOOK

unnecessary risks, and you might end up like the man who rushed ahead without any plan. He tried to travel at night but only injured himself by bumping into trees and fences. Instead of laying low and trying to evade the enemy, he fired at them with his rifle and was caught. Don't lose your temper. Loss of self-control may cause you to stop thinking. When something irritating happens, stop. Take a deep breath and relax; start over.

Face the facts—danger does exist. To try to convince yourself otherwise only adds to the danger.

- **R—Remember where you are.**

You may give yourself away because you are used to acting in a certain way. Doing "what comes naturally" could be the tip-off that you don't belong there.

- **V—Vanquish fear and panic.**

To feel fear is normal and necessary. It is nature's way of giving you that extra shot of energy just when you need it. Learn to recognize fear for what it is and control it. Look carefully at a situation and determine if your fear is justified. When you investigate, you will usually find many of your fears unreal.

When you are injured and in pain, controlling fear is difficult. Pain sometimes turns fear into panic and causes a person to act without thinking. Panic can also be caused by loneliness. It can lead to hopelessness, thoughts of suicide, and carelessness—even capture or surrender. Recognition of the effect of fear and its results helps you overcome panic.

- **I—Improvise.**

You can always do something to improve the situation. Figure out what you need; take stock of what you have; then improvise. Learn to put up with new and unpleasant conditions. Keeping your mind on SURVIVAL will help. Don't be afraid to try strange foods.

- **V—Value living.**

Conserve your health and strength. Illness or injury will greatly reduce your chance of survival

and escape. Hunger, cold, and fatigue lower your efficiency and stamina, make you careless, and increase the possibility of capture. Knowing this will make you especially careful because you will realize that your spirits are low because of your physical condition—not from the danger. Remember your goal—getting out alive. Concentrating on the time after you get out alive will help you value living now.

- **A—Act like the local populace.**

"At the railroad station, there were German guards," one escapee related. "I had an urgent need to urinate. The only rest room was an exposed one in front of the station. I felt too embarrassed to relieve myself in front of all the passersby. I walked throughout the entire town stopping occasionally and inquiring if a rest room was available." This man was detected and captured because he failed to accept the customs of the locals. When you are in a strange situation, accept and adopt local behavior. In this way, you avoid attracting attention to yourself.

- **L—Learn basic skills.**

The best life insurance is to make sure that you learn the techniques and methods of survival so thoroughly that they become automatic. Then the chances are that you will do the right thing, even in panic. Work on the training you are given because it may mean saving your life. Be inquisitive and search on your own for any additional survival knowledge.

GROUP SURVIVAL

You and your entire squad, platoon, or group must make your reactions to survival situations automatic. The best chance for survival belongs to the group that works **TOGETHER** and has a leader who fulfills his responsibilities to the group. If the group remembers the following factors while evading capture, their return to friendly forces should be successful.

Group survival activities should be organized. Group survival depends largely upon the organization of its manpower. Organized action by group members who know what to do and when to do it, during ordinary circumstances and

during a crisis, prevents panic. One technique for achieving organized action is to keep the group well informed. Another is to devise a plan and then stick to it.

Assigning each man a task that fits his personal qualifications most closely is another way of organizing a group. If one man feels he can fish better than he can cook, let him provide the fish. Always determine and use special skills of members of the group.

Panic, confusion, and disorganization are lessened by good leadership. It is the responsibility of the senior member of a group to assume command and establish a chain of command that includes all members of the group. Make certain that each man knows his position in the chain of command and is familiar with the duties of every other man, especially your duties if you are senior. Under no circumstances should leadership of the group be left up to chance acceptance by some member after a situation arises.

If senior, lead your men. Group survival is a test of effective leadership. Maintain respect for your leadership by using it wisely; be the leader, set the example. Watch out constantly to prevent serious arguments. To keep troublemakers from attracting undue attention, to keep those who may "crack up" from disrupting the group, and to prevent carelessness caused by fatigue, hunger, and cold are important parts of your job. Know yourself and your men and be responsible for each individual's welfare.

Develop a feeling of mutual dependence within the group by stressing that each man depends on the other men for survival. Emphasize that wounded or injured men will not be left behind—that each member's responsibility is to see that the group returns intact. This attitude fosters high morale and unity. Each member receives support and strength from the others.

No matter what the situation, the leader must make the decisions. Because he needs intelligence upon which to base his decisions, he should ask for information and advice from other members of the group—much as a general uses his staff. Above all else, the leader must, at all times, never appear indecisive.

Situations arise that must be acted upon immediately. The ability to think on your feet usually determines successful survival. Consider the facts and make decisions rapidly.

SURVIVAL TECHNIQUES

According to the Code of Conduct for members of the Armed Forces, it is your duty to evade capture by the enemy. Also, if captured, you must make every effort to escape. As a SEABEE, you always face the chance of being exposed to conditions that can force you into a life-or-death struggle. Survival in this case depends on your ability to apply the techniques of evading and escaping. There can be no more important reason for making survival techniques part of your basic combat skills.

You can remain alive anywhere in the world when you keep your wits. This is a major lesson in survival. Remember that nature and the elements are neither your friend nor your enemy—they are actually disinterested. Instead, your determination to live and your ability to make nature work for you are the deciding factors.

Your job is to get back. The more you know about conditions peculiar to the region you are in, including the plant and animal life, the better your chances are for survival.

Survival in remote and desolate areas, in the Arctic, desert, or jungle, depends on you. You must be physically fit, have a fundamental knowledge of how to locate water, know what foods are available and how to find and prepare them, and be able to recognize those plants and animals that will harm you.

Water

Without water your chances of living are nil, and all the food in the area means nothing. This is especially true in hot climates where you sweat a lot. Even in cold weather your body needs at least two quarts of water each day; a lesser amount reduces your efficiency.

When you can't find surface water, tap through the earth to the water table for ground water—rain or melted snow that has sunk into the ground. Access to this table and its supply of generally pure water depends upon the contour of the land and the character of the soil.

In rocky soil look for springs and seepages. Limestones have more and larger springs than any other type of rock. Because limestone is easily dissolved, caverns are easily etched in it by ground

water. Look in these caverns for springs. Because lava rock is porous, it is also a good source for seeping ground water. Look for springs along the walls of valleys that cross the lava flow. Be on the lookout for seepage where a dry canyon cuts through a layer of porous sandstone. In areas with a lot of granite rock, look over the hillsides for green grass. Dig a ditch at the base of the greenest area and wait for the water to seep into it.

Water is usually more plentiful and easier to find in loose soil than in rocks. Look for ground water along valley floors or on the slopes bordering the valley because the water table is more likely to surface in these areas. Lands above river valleys also yield springs or seepages along their bases even when the stream is dry. If you decide to dig for water, first look for signs that it is present. Dig in the floor of a valley under a steep slope, or dig out a green spot where a spring was during the wet season. In the low forests, along the seashore, and in river plains, the water table is close to the surface. Very little digging usually yields a good supply of water. Runoff water is found above the water table and includes streams, stagnant pools, and water in bogs. Consider this water contaminated and dangerous even if it is away from human habitation. Boil or treat this water with water purification tablets before you drink it.

You can find water in the dunes above the beach or even in the beach itself. Look in hollows between sand dunes for visible water, and dig if the sand seems moist. On the beach, scoop holes in the sand at low tide about 100 yards inland of the high tide mark. This water may be brackish, but it is reasonably safe. Run it through a sand filter to reduce the brackish taste. **DON'T** drink sea water. The salt concentration of sea water is so high that body fluids must be drawn to eliminate it. Eventually your kidneys will cease functioning.

Watch for water indicators when you are isolated in the desert or arid regions. Some of the signals include the direction in which certain birds fly, the presence of plants, and converging game trails. The sand grouse of Asia, crested larks, and zebra birds visit water holes at least once a day; parrots and pigeons must live within reach of water. Note the direction in which these birds fly and chances are you will find something to drink. Cattails, greasewoods, willows, elderberry, rushes,

and salt grass grow only where ground water is near the surface. Look for these signs and dig. If you don't have a bayonet or entrenching tool, dig with a flat rock, sharp stick, your knife, or a spoon. Places that are visibly damp, where animals have scratched, or where flies hover indicate recent surface water. Dig there for water.

Collect dew on clear nights by sponging it up with your handkerchief. During a heavy dew, you should be able to collect about a pint an hour.

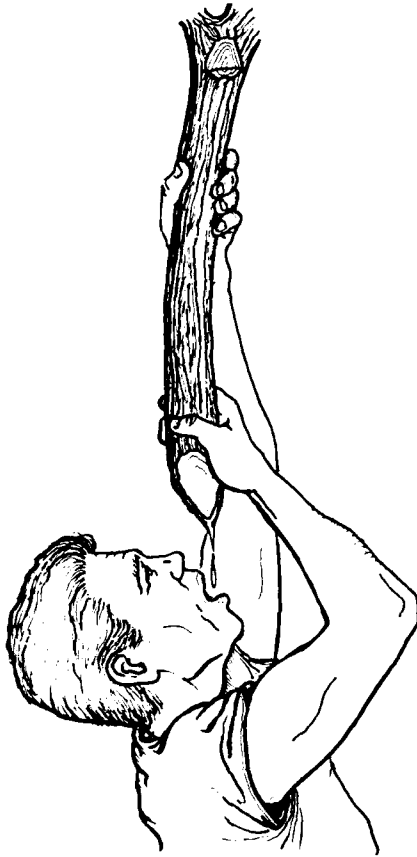
If you are unsuccessful in your search for ground or runoff water or if you do not have time to purify the questionable water, a water-yielding plant may be your best bet. Clear, sweet sap from many plants is easily obtained. This sap is pure and chiefly water. Many plants with fleshy leaves or stems store drinkable water. Try them wherever you find them. Desert plants often have their roots near the surface. The Australian water tree, desert oak, and bloodwood are some examples. Pry these roots out of the ground and cut them into 24- to 36-inch lengths. Remove the bark and suck out the water.

Not all vines yield palatable water, but try any vine you find. Use the following method for tapping a vine. It will work on any species.

1. Cut a deep notch in the vine as high up as you can reach.
2. Cut the vine off close to the ground and let the water drip into your mouth or a container.
3. When the water ceases to drip, cut another section off the top.
4. Repeat this until the supply of fluid is exhausted. (See fig. 16-5.)

If the liquid is a white sap or very dark in color, it is not drinkable. If the liquid is clear, test it for odor. If it is slightly pink or red in color, this normally indicates the presence of tannic acid. If it has no taste or doesn't taste bad, then it is a good source of water.

Buri, coconut, sugar, and nipa palms contain a drinkable sugary fluid. To start the fluid of coconut palm flowing, cut off the tip of the flower stalk after bending it downward. If you cut off a thin slice every 12 hours, you can renew the flow of liquid and collect up to a quart a day.



187.32

Figure 16-5.—Extracting water from vines.

Food

In a short time with very little reasoning, you will realize your second requirement is food. This is especially true during a survival episode when you need every ounce of energy and endurance that you can muster.

Men have been known to live for more than a month without food. But unless you are in extremely difficult circumstances, there is little need to be deprived of something to eat. Nature can be your provider if you know how to use her bounty. Apply the following rules as soon as you realize that you are isolated:

1. Inventory your rations and water. Estimate the length of time you will be on your own.

2. Divide your food—two-thirds for the first half of your isolation and one-third for the second half.

3. Avoid dry, highly flavored foods and meats if you have less than one quart of water for each day. Remember—eating makes you thirsty. Eat food high in carbohydrates—hard candy, fruit bars.

4. Keep strenuous work to a minimum. The less you work, the less food and water you require.

5. Eat regularly if possible; don't nibble. Plan one good meal each day and cook it if you can. Cooking makes food safer, more digestible, and palatable. Also, the time you spend cooking will give you a rest period or time to relax.

6. Always be on the lookout for wild food. With few exceptions, everything you see that walks, crawls, swims, or grows from the soil is edible. Learn to live off the land.

Plants

Experts estimate that about 300,000 classified plants grow on the earth's surface, including many which grow on mountain tops and ocean floors. Of these, 120,000 varieties are edible. Obviously you will not be able to learn about all of these plants from reading this manual. But if you know what to look for in the area in which you find yourself stranded, can identify it, and know how to prepare it properly, you should find enough to eat to keep you alive. You may even surprise yourself with a delicious meal.

Although plants may not provide a balanced diet, especially in the Arctic where the heat-producing qualities of meat are essential, they will sustain you. Many plants, such as nuts and seeds, will give you enough protein for normal efficiency. All edible plants provide energy and calorie-giving carbohydrates.

Plants are available everywhere to provide the necessary energy while you forage for wild meat. You can depend on them to keep you alive if you are injured and unarmed in enemy territory or in an area where wild life is not abundant.

It is generally safe to try wild plant foods if you see them being eaten by birds and animals; however, you will find few plants of which every part is edible. In addition to the obvious sources of plant foods (fruits, nuts, berries, and so forth), many plants have one or more identifiable parts

that have considerable food value. For example, certain roots and other underground parts of plants are rich in starch and are excellent sources of food. Some examples are the following.

1. **WILD POTATO.** This is an example of an edible tuber. The plant is small and found throughout the world, especially in the tropics. (See figure 16-6.)

2. **SOLOMON'S SEAL.** Tubers of Solomon's seal grow on small plants and are found in North America, Europe, Northern Asia, and Jamaica. Boiled or roasted, they taste much like parsnips (figure 16-7).

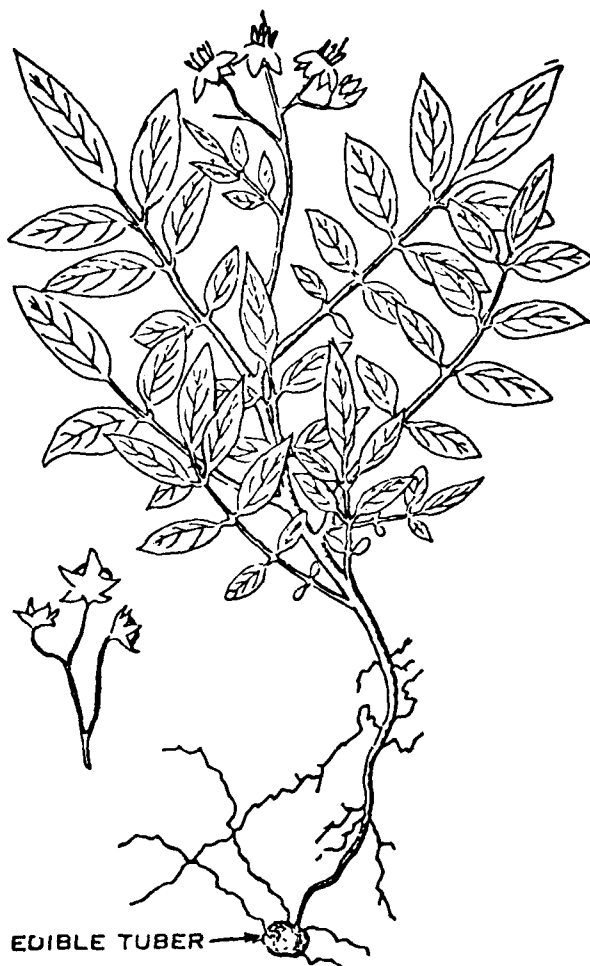
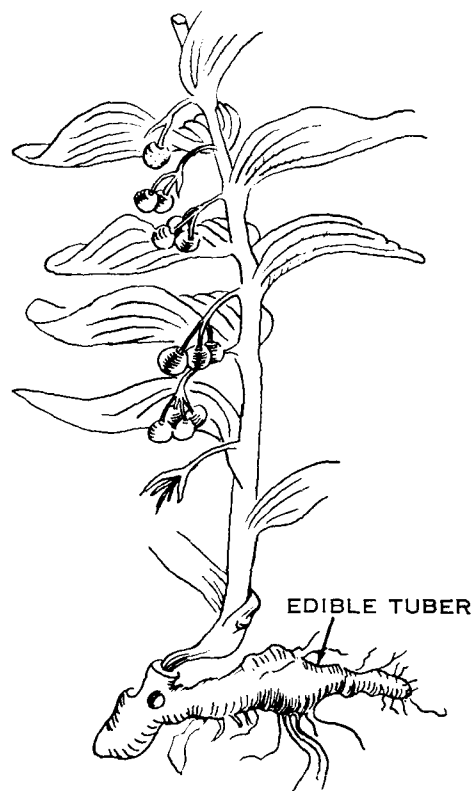


Figure 16-6.—Wild potatoes.

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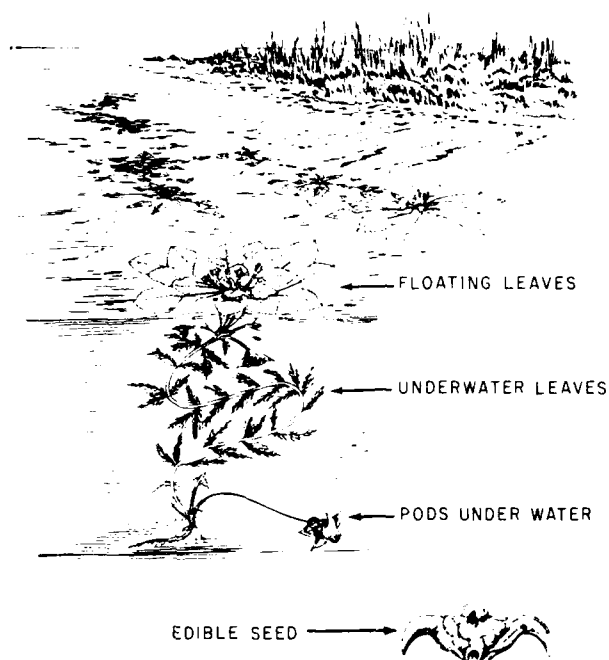


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Figure 16-7.—Solomon's seal.

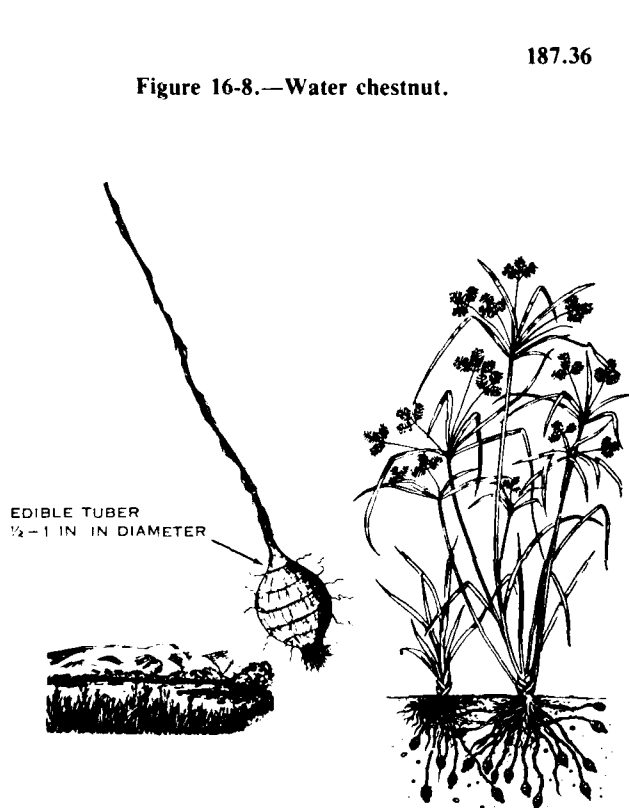
3. **WATER CHESTNUT.** The water chestnut is a native of Asia, but it has spread to both tropical and temperate areas of the world, including North America, Africa, and Australia. It is found as a free-floating plant on rivers, lakes, and ponds in quiet water. The plant covers large areas wherever it occurs and has two kinds of leaves—the submerged leaves that are long, root-like, and feathery and the floating leaves that form a rosette on the surface of the water. The nuts borne beneath the water are an inch or two broad with strong spines that give them the appearance of a horned steer. The seed within the horny structure may be roasted or boiled. (See fig. 16-8.)

4. **NUT GRASS.** Nut grass is widespread in many parts of the world. Look for it in moist, sandy places along the margins of streams, ponds, and ditches. It occurs in both tropical and in temperate climates. The grass differs from true



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Figure 16-8.—Water chestnut.



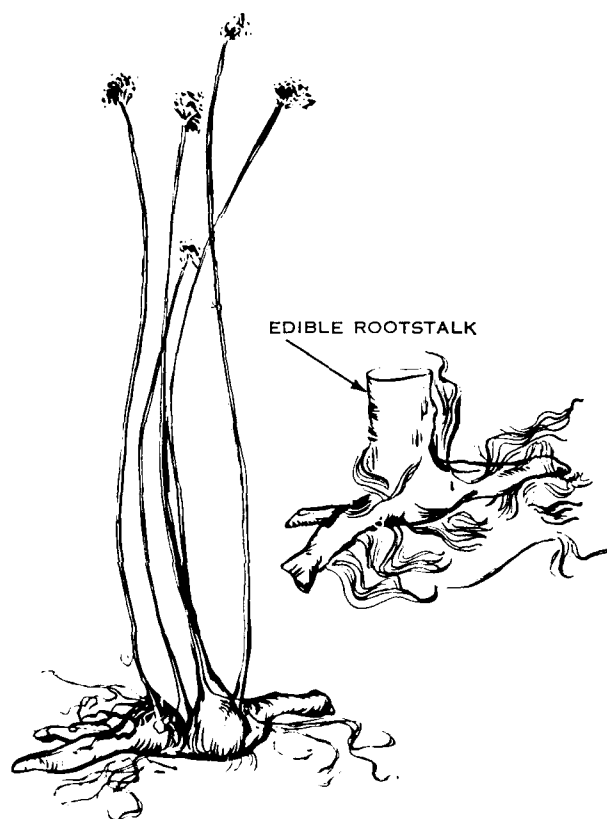
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Figure 16-9.—Nut grass.

grass because it has a three-angle stem and thick underground tubers that grow one half to one inch in diameter. These tubers are sweet and nutty. Boil, peel, and grind them into flour. This flour can be used as a coffee substitute. (See fig. 16-9.)

5. TARO. The taro grows in moist, forested regions of nearly all tropical countries. Taro looks much like a calla lily with leaves up to two feet long and stems about five feet high. The bloom on this plant is a pale, yellow flower about 15 inches long. It has an edible tuber growing slightly below ground level. This tuber must be boiled to destroy irritating crystals. After boiling the tuber, eat it like a potato.

6. BULRUSH. This familiar tall plant is found in North America, Africa, Australia, East Indies, and Malaya. It is usually present in wet, swampy areas. The roots and white stem base may be eaten cooked or raw. (See fig. 16-10.)



187.49

Figure 16-10.—Bulrush.

7. TI PLANT. This plant is found in tropical climates, especially in the islands of the South Pacific. It is cultivated over wide areas of tropical Asia. Both the wild and cultivated plants have coarse, shiny, leathery leaves arranged in crowded fashion at the tips of thick stems. The leaves are green and sometimes reddish. This plant grows a large plume-like cluster of flowers that usually droop. It bears berries that are red when ripe. The fleshy rootstalk is edible and full of starch, and it should be baked for best results.

Animals

Foods derived from animals have more food value per pound than those derived from plants. You can increase your chances of survival by learning the edible or otherwise useful parts of animals. Also, learn how to prepare the edible parts for cooking.

Most birds should be plucked and cooked with the skin on to retain their food value. After a bird is plucked, cut off the neck close to the body and clean out the insides through the cavity. Wash it out with fresh, clean water. Save the neck, liver, and heart for stew. Most birds are easier to pluck after being scalded. Waterfowl are an exception; they are easier to pluck dry. Scavenger birds, like buzzards and vultures, should be boiled at least 20 minutes before you cook them. This kills any parasites. Save all the feathers plucked from birds. You may want to use them for insulating your shoes or clothing or for bedding. Bird eggs are among the safest of foods. You can hard boil eggs and carry them for days as reserve food.

Clean and dress the carcass of a fur-bearing animal as soon as possible after killing it because to delay will make your job harder. Cut the animal's throat and allow the blood to drain into a container. The boiled blood is a valuable source of food and salt. Save the kidneys, liver, and heart.

Use the fat surrounding the intestines. All parts of the animal are edible, including the meaty parts of the skull, such as the brain, eyes, tongue, and fleshy portions. Save the skin. It is light when dried and is good insulation as a bed cover or article of clothing.

The meat of rats and mice is palatable, particularly if cooked in a stew. Rats and mice should be skinned and gutted, then boiled about 10 minutes before cooking. Either may be cooked with dandelion leaves. Always include the livers. Snakes (excluding sea snakes) and lizards are also edible. Remove the head and skin before boiling or frying snakes.

Dogs, cats, hedgehogs, porcupines, and badgers should be skinned and gutted before cooking. Prepare them as stew with a quantity of edible leaves. Dog and cat livers are especially valuable.

Crabs, crayfish, shrimps, prawns, and other crustaceans require cooking in order to kill disease-producing organisms. They spoil rapidly, however, and should be boiled alive immediately after capture. Shellfish can be steamed, boiled, or baked in the shell. Shellfish make excellent stew with greens or tubers.

Grasshoppers, locusts, large grubs, termites, ants, and other insects are easy to catch and will provide nourishment in an emergency.

Methods of Cooking and Preserving Foods

Besides making most foods more tasty and digestible, cooking makes them safer to eat by destroying bacteria, toxins, and harmful plant and animal products in the food. Your survival chances increase as your knowledge of field survival skills increases, as you improve your ability to improvise, and as you learn to apply the principles

of cooking and preserving the foods you obtain in the field.

ROASTING OR BROILING.—This is a quick way to prepare wild plant foods and tender meats. Roast meat by putting it on a stick and holding it near embers. Roasting hardens the outside of the meat and retains the juices.

BAKING.—Baking is cooking in an oven over steady, moderate heat. The oven may be a pit under your fire, a closed vessel, or leaf or clay wrapping. To bake in a pit, first fill it with hot coals. Drop the covered vessel containing water and food in the pit. Place a layer of coals over it; then cover the vessel and pit with a thin layer of dirt. If possible, line your pit with stones so that it will hold more heat. Pit cooking protects food from flies and other pests and reveals no flame at night.

STEAMING.—Steaming can be done without a container and is suitable for foods that require little cooking, like shellfish. Place your food in a pit filled with heated stones over which leaves are placed. Put more leaves over your food. Then force a stick through the leaves down to the food pocket. Pack a layer of dirt on top of the leaves and around the stick. Remove the stick and pour water to the food through the hole that remains. This is a slow but effective way to cook.

PARCHING.—Parching may be a desirable method of preparing some foods, especially grains and nuts. To parch food, place it in a metal container and heat slowly until it is thoroughly scorched. In the absence of a suitable container, a heated, flat stone may be used. Anything that holds food or water may be used as a container—turtle shells, sea shells, leaves, bamboo, a section of bark.

DRYING.—Plant food can be dried by wind, sun, air, fire, or any combination of these four. The object of drying food is to get rid of the water. Cutting meat across the grain in one-fourth

inch strips and either drying it in the wind or smoke will produce “jerky.” Put the strips of meat on a wooden grate and dry them until the meat is brittle. Use willow, alders, cottonwood, birch, and dwarf birch for firewood because woods that contain pitch, such as pine and fir, make the meat unpalatable. Hang the meat high and build a slow smouldering fire under it. Perhaps a quicker method of smoking meat is the following:

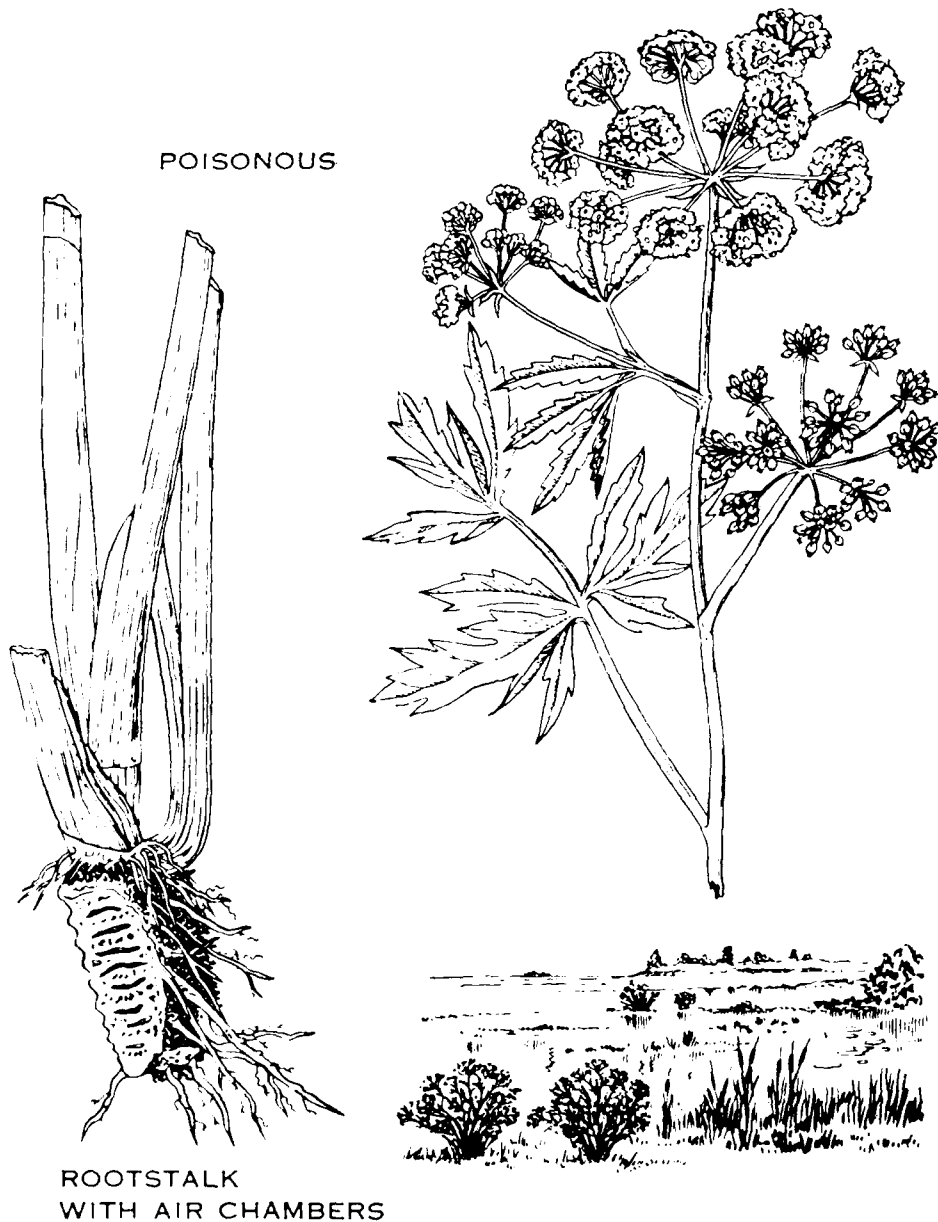
1. Dig a hole in the ground about 1 yard deep and one-half yard wide.
2. Make a small fire at the bottom of the hole. (After starting the fire, use green wood because it will smoke.)
3. Place an improvised wooden grate about three-fourths of a yard up from the bottom.
4. Use poles, boughs, leaves, or any available material to cover the pit.

The methods of preserving fish and birds are much the same as for other meats. To prepare fish for smoking, cut off the heads, and remove the backbones. Then spread the fish flat and skewer in that position. Thin willow branches with bark removed make good skewers. Fish also may be dried in the sun. Hang them from branches or spread them on hot rocks. When the meat dries, splash it with sea water to salt the outside. Don't keep seafood unless it is well dried and salted. Plantains, bananas, breadfruit, leaves, berries, and other wild fruits can be dried by air, sun, wind, or fire, either with or without smoke. Cut fruit into thin slices and place in the sun or before a fire. Mushrooms dry easily and may be kept indefinitely. If mushrooms are dried, soak them in water before you use them.

Harmful Plant and Animal Foods

There are relatively few poisonous plants and animals. Learn to recognize and avoid them.

In some places, such as the Arctic and subarctic regions, there are less than a dozen plants that are poisonous. Included are the water



187.76

Figure 16-11.—Water hemlock.

hemlock (fig. 16-11) and poisonous mushrooms shown in figures 16-12 and 16-13.

Poisonous plants are found in the tropics in no greater proportion than in the United States. If in doubt about whether plants

are poisonous or nonpoisonous, use the following rules:

- Observe the habits of vegetable-eating animals, such as birds, rodents, monkeys, baboons, and bears. Usually the foods these



Figure 16-12.—Fly agaric.

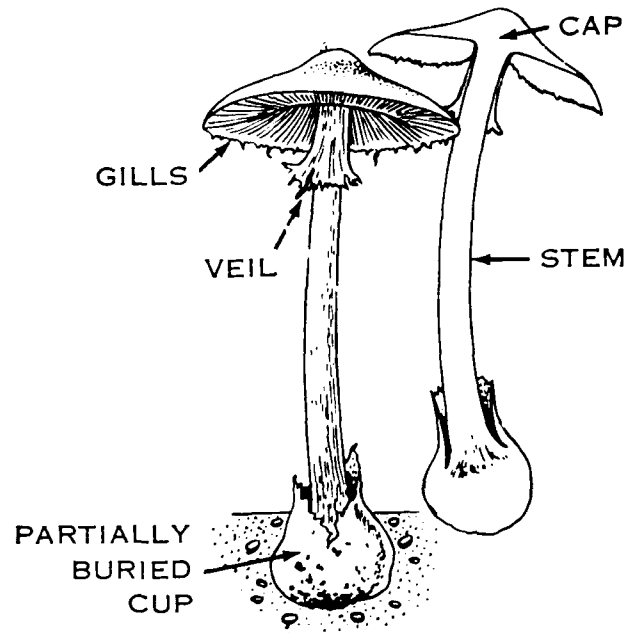
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animals eat are safe for humans. Cook all plant foods because cooking removes plant poisons, except those in mushrooms. Two poisonous mushrooms are shown in figures 16-12 and 16-13.

- Avoid eating plants that taste bitter. Also avoid eating untested plants that have milky juices. Do not let the milky juice contact your skin. This does not apply to the numerous figs, breadfruits, papaya, and barrel cactus.

- Guard against fungus poisoning from infected heads of cereals or grasses by discarding grain heads having black spurs in place of normal seed grains.

Most animal foods that you encounter are edible; but some, like mollusks, may introduce parasites into your body—especially if eaten



187.78

Figure 16-13.—Death Angel with gills, veil, stem, and cup.

uncooked or when they are not fresh. Crustaceans are almost always edible; but they spoil rapidly and harbor harmful parasites. Be sure to cook the fresh water variety; eat the salt water variety raw if you desire.

There are no simple ways of telling whether or not a fish is edible. Often fish that are edible in one area are not in another. This depends on the place, their source of food, or even the season of the year. At first, eat only small portions of any fish. If you feel no ill effects, it is probably safe to continue eating the fish.

In the Arctic there is a fish called the sculpin that lays poisonous eggs; the black mussel may be poisonous at any season, and its poison is as dangerous as strychnine. If you kill a seal or polar bear, don't eat its liver. This liver is too high in vitamin A, which can make you sick. Don't eat polar bear meat before it is cooked. It is always diseased.

ESCAPE

What happens if you become a prisoner of war? After all, it is possible. Isolation, fear,

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injury—all work in favor of the enemy to increase your chances of capture in spite of a determined effort on your part to evade. The surrender of your arms, however, doesn't mean that you forfeit your responsibilities as a member of the fighting forces of the United States. The Armed Forces Code of Conduct directs that you begin planning your escape the minute you are taken prisoner.

Escape is tough; making it work is even tougher. It demands courage, cunning, and much planning—of seeking ways out, a route to follow, and the location of friends. Above all, escape demands physical stamina—stamina that you must acquire under the worst conditions imaginable. Experience has proved that “model” camps, where rations are regular and treatment considerate, are the exception. But no matter what extremes you encounter as a POW, your aim should be—to keep yourself as physically able and sufficiently equipped for breaking out as soon as possible.

If you are captured, try to make your escape early. You may never be in better physical condition to escape than at the moment you are captured. Prison rations are barely enough to sustain life, certainly not enough to build up a reserve of energy. The physical treatment, lack of proper medical care, and insufficient rations of prison life soon show their effects in morale and physical weakness, night blindness, and loss of coordination and reasoning power. There are other reasons for making your escape early.

Friendly artillery fire or air strikes may give you a chance to get away. The first guards you will have are not as well trained in handling prisoners as the guards are farther back from the front lines. Some of the first line guards may even be walking wounded and distracted by their own condition. You know something about the terrain where you are captured, and you know the approximate location of friendly units. Several days later and many miles away, you may be in strange territory.

The exact way you make your escape depends on what you can think of to fit the particular situation. The only general rules are to make an early escape and do it when the enemy's attention is distracted.

To escape from a prison camp is much more difficult and requires more detailed planning. It must be organized and supported in the same way as any other military operation.

Once you escape, it may not be easy to contact friendly units, even when you know where they are. Approach the solution of the problem in the same way as you would if you were a member of a lost patrol. Time your movements so you can pass through the enemy forward areas at night and arrive between the enemy and friendly units at dawn. A good plan is to find a ditch or shellhole where you have cover from both friendly and enemy fire. Attract the attention of the friendly forces by waving a white cloth, shouting, exposing or laying out a panel, or some other method. Doing this alerts friendly forces, who are prepared to accept any small group which appears willing to surrender or regain contact. Alerted, they are not as likely to shoot you on sight.

S-A-T

Since the conditions in various POW camps differ, it is impossible to provide a specific survival plan for each situation. What you need is a guide to help you plan to make the best of what you have. Here is one such plan that you can remember by the word S-A-T—Save, Add to, Take care of.

Save

What can you save in a POW camp? Everything—clothing, pieces of metal, cloth, paper, string—anything. A piece of twine may mean success or failure when it comes time to break out. Hide these items under the floor or in a hole in the ground. If they are discovered, they may appear harmless and little or nothing will be done to punish you.

Wear as few clothes as possible. Save your shoes, underwear, shirts, jacket, and any other items of clothing that will protect you from the elements when you begin your trip back.

Save any nonperishable foods that you receive from the Red Cross or your captors. Candy, for example, comes in handy as a quick source of energy when you are traveling. If you do not receive candy, save each issue of sugar given you by the enemy. When you get enough, boil it down

into hard candy. **SAVE** it until you build up your supply. Canned foods that you might receive are ideal for storing. However, if the enemy punctures the cans to prevent your saving them, you may still preserve the food by resealing the cans with wax or some other field expedient. It may be feasible for you to save this food by recooking it and changing its form. Other foods to hoard against the day of your escape include suet and cooked meat, nuts, and bread.

Save pieces of metal no matter how insignificant they may seem. Nails and pins can serve as buttons or fasteners. Old cans are excellent for improvised knives, cups, or food containers. If you are fortunate enough to have a razor blade, guard it. Use it for shaving only. Devise ways of sharpening it—rub it on glass or stone or some other hard surface. A clean shave is a good morale booster.

Save your strength but keep active. A walk around the compound or a few mild calisthenics keep your muscles toned. Sleep as much as you can. You won't get much rest on your way back after you escape.

Add To

Use your ingenuity. Select those items that you can't get along without and supplement them; for example, your rations. There is more to eat in and around your compound than you think. When you are allowed to roam around the camp grounds, look for natural foods native to the area, such as roots, grasses, leaves, barks, and insects. If possible, add these foods to your escape cache. They will keep you alive when the going gets tough.

Supplement your clothing so the more durable garments are in good repair when you escape. A block of wood and a piece of cloth make good moccasins; they will save your boots. Rags can substitute for gloves; straw can be woven into hats. Don't forget to salvage clothing from the dead.

Take Care Of

Probably the most important part of any plan for survival is the "take-care-of" phase. Maintain what you have. There won't be any reissue when your shoes wear out or you lose your jacket. Also, it is easier to maintain good health than to regain it once you lose it.

Put some of your clothing into your escape cache. Watch the rest for early signs of wear and repair it with improvised material, if necessary. A needle made from a thorn, nail, or splinter and threaded with unraveled cloth, can mend a torn pair of trousers. Wood, canvas, or cardboard bound to the soles of your shoes will save them from wear. Even paper will suffice as a reinforcing insole if your shoes do wear through.

Good physical health is essential to survival under any circumstances. It is especially important in a POW camp where living conditions are crowded and food and shelter inadequate. This means you must use every device possible to keep yourself well.

Soap and water is a basic preventive medicine; so keep clean. If water is scarce, collect rainwater, use dew, or simply rub yourself daily with a cloth or your bare hands. Pay attention to areas on your body that are susceptible to rash and fungus infection—between your toes, your crotch, and scalp.

Keeping clean also applies to your clothing. Use soap and water when you can spare it. Hang your clothes in the sun to air if soap and water are not available. Examine the seams of your clothing and hairy portions of your body frequently for lice and their eggs. Lice infected with disease can kill you. A possible way to get laundry service or even a bath is to tell your guard that you are infested with lice, whether or not your complaint is true. The prison authorities, fearing that lice on prisoners may cause an outbreak of disease borne by lice among the civilian and guard population might provide this service.

In the event you become ill, report your condition to the camp authorities. The chance that you will receive aid is worth the try.

CHAPTER 17

RULES OF WAR

The laws of armed conflict are the concern of every member of the Armed Forces: soldiers, sailors, airmen, marines, and yes, even SEABEES. Because of the important sound of the term "laws of armed conflict," you may think that only people, such as the Chief of Naval Operations, the Secretary of the Navy, the Secretary of Defense, and the President, concern themselves with the rules of war. While individuals such as these from many countries have, over the years, drafted the basic documents governing man's treatment of his fellow man in wartime, the laws of armed conflict remain the direct concern of every serviceman.

LAWS OF WAR

The principles behind the laws of armed conflict can be stated in the following question: How should you, an individual SEABEE, conduct yourself in wartime operations to accomplish your mission while still respecting the rights of civilians, your enemies, and allies? This chapter provides you with some basic information on what to do and, just as important, what not to do in wartime situations.

WHY WE NEED LAWS IN WAR

Unfortunately, war is as old as man himself. People cause wars, weapons don't. Man creates the weapons, which are merely the instruments that a nation uses to carry out its war objectives. Genghis Khan, the ancient Asian warlord, killed or maimed a greater percentage of people than any other leader in history. He did it with bows and arrows and other similar primitive weapons. During Genghis Khan's era, there were no rules

of war. Although man continues today to be the force behind the weapons, there exists now a certain orderliness to which people of most countries who find themselves on a battlefield subscribe.

The positive side of mankind has managed to improve the conditions under which war is conducted since the era of Genghis Khan. As newer weapons of warfare have made it easier for man to kill his fellow man, nations have sensed a need to eliminate unnecessary death, destruction, and suffering. This need has been reflected in the moral values of civilized man and also in his military policies.

Binding customs and formal laws of war, presented in the Geneva conventions and The Hague regulations, have evolved. They legally bind most nations to the practices set down at Geneva and The Hague. The United States has agreed to these rules. Any violation of them is the same as a violation of the laws of the United States itself. The United States has led the world in adopting rules for its military forces. These rules recognize that enemies are also human beings and that captured or detained people are entitled to retain their fundamental rights as humans regardless of their past conduct or beliefs. Every SEABEE has the duty, therefore, to know and obey the laws of armed conflict.

History shows that discipline and high morale led our military forces to victory in battle after battle. These same characteristics apply to obedience to the laws of armed conflict. Although you will be in uniform and be an instrument of a nation state (the United States) in an armed conflict, this does not give you license to do anything you wish to do. There are limits on what you can do when waging war, and those limits

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are established by the laws of armed conflict. This chapter explains what you can and cannot do.

GENERAL PRECEPTS OF THE LAWS OF ARMED CONFLICT

When you enter into an armed conflict in another country, you should be aware of many of the characteristics of the country. Knowledge of these characteristics will better prepare you to follow the tenets of the laws of armed conflict.

Geography

A general understanding of a nation's geography will permit you to know where the country's population is concentrated. That knowledge should prepare you to deal with civilians and the enemy as you encounter them. In addition, you should know the general area of the country in which you are operating and the nations that border it. This knowledge may help you in understanding any trends that may have an effect on carrying out the laws of armed conflict. You should know the capital city and the other major cities, the characteristics of the land (mountains, deserts, plains, and so forth), and the climate. Knowledge of all these features will help you to deal with rules of war situations that might arise during your time in the country. You should receive information about the general characteristics of a nation's geography as part of instructional briefings given in operational deployments.

People

Knowledge of the country's people can be invaluable to you in how you conduct yourself under the rules of war. Since nearly all offenses under the laws of armed conflict involve people, the more you know about the civilian populace of a country and of your enemy, the better off you will be. Know their ethnic backgrounds, their language, the educational level of the people, the very important cultural characteristics (particularly if they are different than the culture of the United States), the religions of the country, and the social customs of the people.

Knowledge of the people is probably the most important thing for you to know about the

country. Without it you cannot begin to understand the way the people think and act. Accordingly, the chances of doing something in violation of the rules of war increase. If the enemy and the people are one and the same, then the questions posed above will serve for both. If not, you will need to ask the same questions about your enemy. You must know the military and nonmilitary characteristics of your enemy. Again, listen carefully to briefings that tell you important facts about the enemy country's people.

History

There is no need for you to know the long and detailed history of a country except as it relates to why you are there. Historical circumstances involving politics, religion, or cultural values may have led to you being in the country. You need to have knowledge of, and be sensitive to, the historical circumstances dictating U.S. Armed Forces involvement in the country. Pay attention when you receive briefings on these matters. Read what you can find on the subject (newspapers, periodicals, and so forth). Knowing the country's history as it relates to your involvement can serve you well in a situation where you might have to decide what to do in a wartime situation under the laws of armed conflict.

Economy

Is the country poor or wealthy? Does it have wealth concentrated in a few people and enormous pockets of poverty among the general populace? You need answers to these questions because such conditions may contribute to how you deal with the country's people and the enemy. Current economic conditions are also important. (These include the conditions of growth, inflation, deflation, unemployment, poverty, and so forth.) Knowledge of the economic condition of a country can lead you to understand better how a country's people and the enemy might behave toward you and might assist in preventing a violation of the rules of war.

Foreign Relations

Knowing the country's alliances, allies, traditional enemies (if any), and the country's role

in international organizations (for example, the United Nations) can provide you with an understanding of what to expect. Will the country comply with the laws of armed conflict that you fight under, or can you expect behavior contrary to your training?

Government

Knowing something about the nature of the national government in a country may better prepare you to understand the nature and conduct of your enemy as well as the civilian populace. Is the country's government bound by the Geneva conventions and The Hague resolutions? Will the government prosecute you for a crime against civilians or against the enemy for a violation of the rules of war? Even if the government does not comply with the rules of war in any way, your obligation as a SEABEE is to conduct yourself under the laws of armed conflict that you are taught.

U.S. Relations with the Country

The United States' relations with the country that you are entering may be good, bad, or somewhere between these two extremes. The country's government may want the SEABEES to be there, but some of its people may not. You may encounter situations or actions from the enemy, from the government, or from the general population that will try your patience. They may treat you as "Yankee, Go Home!" If so, you must maintain your self-control and not violate the principles you have learned under the laws of armed conflict. You should be familiar with our relations with the country you are entering. This knowledge can serve you well in preventing the creation of a situation where you might violate the rules of war.

Basically, what you have just read can be summed up in eight words: Know the country into which you are going. That's as important as knowing terrain features and enemy tactics.

Along with knowledge of the country in which you are operating, make sure you understand your mission fully. Because while you are conducting your mission, you will encounter situations when you will have the opportunity to succeed or fail in your practice of the laws of armed conflict.

When you complete this chapter, you should have sufficient knowledge of what to do and what not to do under most combat situations. This knowledge will protect you from violating the laws of armed conflict. If you encounter a situation where you are not sure about what action to take to carry out your mission, get clearance from the next higher authority before continuing. For example, if some military action by you might endanger the lives of some local civilians and you are not sure how to proceed, be certain to get approval of your next action from the next higher authority.

YOUR CONDUCT UNDER THE LAWS OF ARMED CONFLICT

The laws of armed conflict tell you what you can and cannot do in combat situations. With the training you will receive, you will have the necessary discipline to do the right thing. But if you do not learn how you should conduct yourself in combat, you will be punished for mistakes.

All persons in uniform, carrying a weapon or participating in any way in military operations or activities are known as combatants. Under the laws of armed conflict, only combatants are considered proper targets and may be fired upon. All others are called noncombatants. Noncombatants include civilians, medical personnel, and chaplains. Knowing the difference between combatants and noncombatants in guerrilla war situations may sometimes be difficult and requires great care. Humane treatment of noncombatants may also assist you in obtaining valuable intelligence to allow you to pursue your mission better. If you are in doubt about telling the difference between combatants and noncombatants, consult your superior before pursuing any course of action.

Enemy Combatants

Never attack enemy soldiers who surrender or enemy soldiers who are captured, sick, or wounded. When you have prisoners of war (POWs), you should follow the six S's: search, secure, silence, segregate, safeguard, and speed the prisoners to the rear. You must never kill, torture, or mistreat a prisoner because such actions are a violation of the law. Besides,

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prisoners may provide you with vital information about the enemy. Treating a prisoner badly will also discourage other enemy soldiers from surrendering and harden the enemy's will to resist. But if you treat your prisoners well, your fairness will encourage the enemy to treat his prisoners (your buddies) well. Humane treatment of POWs is right, honorable, and required under the laws of armed conflict. Improper treatment of prisoners by you is punishable by court-martial.

Let enemy soldiers surrender. The enemy may use different signals to convey to you that he is surrendering, but all of the signals should be noticeable. It is illegal to fire on an enemy who has thrown down his weapon and offered to surrender.

You should also provide medical care to the wounded whether friend or foe. You are required under the laws of armed conflict to provide the same kind of medical care to the sick and wounded as you would provide for your own personnel.

When you capture someone, you may not be certain if the person is an enemy. That determination is made by specifically trained personnel at a higher headquarters. You may question your captives about military information of immediate value to your mission, but you may never use threats, torture, or other forms of coercion to obtain information.

You may not take personal property from a prisoner except those items that are clearly of a military or intelligence value (weapons, maps, or military documents). You do this only after the prisoner has been secured, silenced, and segregated. You take nothing that is not of military value. Only an officer may take custody of the personal effects of a prisoner.

Captives may perform some types of work, but the work must not relate to assisting your war effort. The acceptable work performed must be limited to allowing captives to dig foxholes or build bunkers only for their own protection. Under the laws of armed conflict, you may never use captives as a shield for your attack or defense against the enemy; to search for, clear, or place mines or booby traps; or to carry your ammunition or heavy gear.

Under the rules of armed conflict, you are not permitted to attack villages, towns, or cities. But you are allowed to engage the enemy that is in

a village, town, or city and to destroy any equipment or supplies that the enemy has there when your mission requires it. In all cases, you must not create more destruction than is necessary to accomplish your mission. When you use firepower in a populated area, you must attack only the military targets.

You may not attack **PROTECTED PROPERTY**. While some protected property may mean little to you, the property in question may be of cultural importance to the people of the country. Examples of protected property include buildings dedicated to religion, art, science, or charitable purposes; historical monuments; hospitals and places where the sick and wounded are collected and cared for; and schools and orphanages for children. If the enemy uses these places for refuge or for offensive purposes, your commander may order an attack. It is common sense to destroy no more than the minimum amount of protected property consistent with carrying out your mission. To do more may undermine your mission.

Civilians

Earlier in this chapter, we discussed why you should know as much as possible about the country in which you are operating. Once there, you need to treat civilians humanely and private property as if it were your own.

Do not violate civilians' rights in war zones. If you know something about the people's culture and practices, you will have little trouble recognizing civilians' rights. Make sure civilians are protected from acts of violence, threats, and insults both from the enemy and from any of your fellow SEABEES.

On occasion, it may be necessary to move or resettle civilians because such action is urgently required for military activities. Under no circumstance do you burn civilian property without approval of higher authority. Similarly, you do not steal from civilians. Failure to obey these rules is a violation of the laws of armed conflict and punishable by court-martial.

Under no circumstances should you fire upon any medical personnel or equipment used for the medical welfare of the people or the enemy. Most medical personnel and facilities are marked with a red cross on a white background. However, a

few countries use a different symbol. This is one reason why it is important to be familiar with the customs of the country in which you are operating. Similarly, never pose as Red Cross personnel when you are not. Your life may depend on the proper use of the Red Cross symbol.

Parachutists are considered helpless until they reach the ground. Under the rules of war, you are not allowed to fire at them while they are in the air. If they resist with weapons upon landing or do not surrender, you may fire on them. Paratroopers, on the other hand, are always considered combatants and may be fired on while they are still in the air.

Under the laws of armed conflict, you may not use poison or poisoned weapons. However you may use nonpoisoning weapons to destroy the enemy's food and water in order to prevent him from using them.

You may not alter your weapons in order to cause unnecessary suffering to the enemy. You cannot use altered rounds to inflict greater destruction on the enemy. These alterations are forbidden under the laws of armed conflict.

WHAT HAPPENS WHEN RULES ARE VIOLATED

We have given you some basic rules showing what you can and cannot do in a wartime situation, relating to the laws of armed conflict. This section instructs you on what to do if one of the rules is violated by other personnel.

You must do your best to prevent violations of the laws of armed conflict by others because those are criminal acts. If you see a criminal act about to happen, you should try to prevent it by—

- arguing against it.
- threatening to report the criminal act,
- repeating the orders of your superiors,
- stating your personal disagreement, or
- asking a senior individual present to intervene.

You will be able to do this if you are totally familiar with the country in which you are operating and are knowledgeable about the rules of war. In the event the criminal act immediately endangers your life or the lives of others, you may use the exact amount of force needed to prevent

the crime, but do this only as a last resort. You should immediately report the criminal act through your chain of command. If the criminal act is committed or about to be committed by your immediate superior, report the act to his immediate superior. You are required to do this by the laws of armed conflict. Conversely, you are not required to commit a crime under the laws of conflict. If you are ordered to commit a crime under the rules of war, you must refuse to follow the order and report your refusal to the next higher authority. You can be prosecuted for carrying out an unlawful act under the laws of war, so you must know what is legal and act by following the rules of armed conflict.

CODE OF THE U.S. FIGHTING FORCE

The Code was prescribed by the President of the United States in 1955 as a simple, written creed applying to all American fighting men. The words of the Code, presented in six articles, state the principles that Americans have honored in all the wars this country has fought since 1776.

The Code is not intended to provide guidance on every aspect of military life. For that purpose there are military regulations, rules of military courtesy, and established customs and traditions. The Code is in no way connected with the *Uniform Code of Military Justice* (UCMJ). The UCMJ has punitive powers, the Code does not.

The six articles of the Code can be divided into three categories. Articles I and VI are general statements of dedication to country and freedom. Conduct on the battlefield is the subject of Article II. Articles III, IV, and V concern conduct as a prisoner of war.

Article I

I am an American fighting man. I serve in the forces which guard my country and our way of life. I am prepared to give my life in their defense.

It is a long-standing tradition of American citizens to willingly answer the call to arms when

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the peace and security of this nation are threatened. Patrick Henry stated it best in the early days of our country when he said, "... give me liberty or give me death." Nathan Hale, captured by the British during the Revolutionary War and charged with spying, personified the spirit of the American fighting man when he spoke the immortal words, "I only regret that I have but one life to lose for my country," just before his execution by hanging.

More recently, the threat to America has been less obvious as small countries such as South Korea and South Vietnam have borne the brunt of our enemies' attacks. Nevertheless, Americans have risen to the challenge and have proven their dedication and willingness to make the supreme sacrifice as much as in any of the wars in our history.

In June 1965, Construction Mechanic Third Class David G. Shields served with U.S. Navy SEABEE Team 1104 at Dong Koai, supporting 5th Special Forces Group (Airborne), 1st Special Forces. Although wounded when an estimated reinforced Viet Cong regiment employing machine gun, heavy weapons, and arms placed intensive fire on the unit, CM3 Shields continued to resupply his fellow Americans with needed ammunition to return the enemy fire for a period of approximately 3 hours. Wounded a second time during this attack, CM3 Shields assisted in carrying a more critically wounded man to safety. Then, he resumed firing at the enemy for 4 more hours. CM3 Shields unhesitatingly volunteered to accompany the commander and knock out an enemy machine gun emplacement that was endangering the lives of all personnel in the compound because of the accuracy of the enemy fire. Advancing toward the objective with a 3.5-inch rocket launcher, the two men succeeded in destroying the enemy machine gun emplacement, undoubtedly saving the lives of many of their fellow servicemen.

CM3 Shields fell mortally wounded by hostile fire while returning to his position. He was later awarded the Medal of Honor for his courageous actions. His bold initiative and fearless devotion to duty are perfect examples of the meaning of the words of Article 1 of the Code.

Article II

I will never surrender of my own free will. If in command, I will never surrender my men while they still have the means to resist.

This is an American tradition that dates back to the Revolutionary War. An individual may never voluntarily surrender himself. If isolated and unable to fight the enemy, he is obligated to evade capture and rejoin friendly forces at the earliest possible time.

John Paul Jones always comes to mind when one reads Article II of the Code. In 1779 the captain of the *Bonhomme Richard* challenged two British ships of war, the *Serapis* and the *Countess of Scarborough*. Old, slow, and hopelessly outclassed the *Richard* was being badly battered, repeatedly set on fire, and rapidly filling with water when the captain of the *Serapis* called, "Do you ask for quarter?"

"I have not yet begun to fight," replied John Paul Jones. Hours later, the *Serapis* struck her flag; and Jones and his crew boarded and captured the British ship as they watched their own ship sink.

Where a unit is involved, the officer in command may never surrender that unit to the enemy while it has the power to resist or evade. A unit that is cut off or surrounded must continue to fight until it is relieved by, or able to, rejoin friendly forces.

Article III

If I am captured, I will continue to resist by all means available. I will make every effort to escape and aid others to escape. I will accept neither parole nor special favors from the enemy.

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Article IV

If I become a prisoner of war, I will keep faith with my fellow prisoners. I will give no information or take part in any action which might be harmful to my comrades. If I am senior, I will take command. If not, I will obey the lawful orders of those appointed over me and will back them up in every way.

Article V

When questioned, should I become a prisoner of war, I am required to give name, rank, service number, and date of birth. I will evade answering further questions to the utmost of my ability. I will make no oral or written statements disloyal to my country and its allies or harmful to their cause.

The misfortune of being captured by the enemy does not end a SEABEE's usefulness to his country. His duty is to continue to resist the enemy by all possible means and to escape and assist others to escape. A SEABEE may not accept parole from the enemy or special favors, such as more food, warm clothes, less physical restrictions, and so forth, in return for promises not to escape or informing or providing information to the enemy.

Informing, or any other action endangering the well-being of a fellow prisoner, is forbidden. Prisoners of war will not help the enemy by identifying fellow prisoners who may have knowledge of particular value to the enemy and who may, therefore, be made to suffer brutal interrogation.

Strong leadership is essential to discipline. Organization, resistance, and even survival may be extremely difficult without discipline. Personal hygiene, sanitation, and care of sick and wounded prisoners of war are absolute "musts." All United

States officers and noncommissioned officers will continue to carry out their responsibilities and exercise their authority if captured.

The senior line officer or noncommissioned officer within the prisoner of war camp, or group of prisoners, will assume command according to rank or date of rank, without regard to their branch of service. He is the lawful superior of all lower ranking personnel.

If the senior officer or noncommissioned officer is incapacitated or unable to command for any reason, command will be assumed by the next senior man. This responsibility cannot be avoided.

Article VI

I will never forget that I am an American fighting man, responsible for my actions, and dedicated to the principles which made my country free. I will trust in my God and in the United States of America.

Article VI and Article I of the Code are quite similar. The repeated words "I am an American fighting man" are perhaps the most important words of the Code, because they signify each American's faith and confidence in his God, his country, and his service. Since John Paul Jones made his defiant reply, "I have not yet begun to fight," to the present, Americans have traditionally fought the enemy wherever he was found and with whatever weapons were available. When captured, the American fighting man has continued the battle in a new arena. When facing a Communist interrogator, he has been under fire just as though bullets and shell fragments were flying about him. Disarmed, the POW has fought back with mind and spirit, remaining faithful to his fellow POWs, yielding no military information, and resisting every attempt of indoctrination. Every SEABEE has the responsibility to honor these traditions by carefully adhering to the meaning of each article of the Code. The many Americans who have accepted this responsibility are heroes in the finest sense of the word.

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In February 1966, Lieutenant (jg) Dieter Dengler, USNR, was on a bombing mission over North Vietnam when his aircraft was badly damaged by ground fire. LTJG Dengler crash-landed his aircraft in nearby Laos and attempted to evade capture. After successfully evading the enemy for 1 day, he was captured and led to a village where he was interrogated and told to sign a Communist propaganda statement condemning the United States. LTJG Dengler's repeated refusal to give more than his name, rank, service number, date of birth, or to sign any statements, resulted in severe beatings. When he continued to refuse to answer questions, he was tied behind a water buffalo that dragged him through the brush. The interrogations and beating continued for 3 days, but LTJG Dengler refused to give in. Later, he escaped from his guards but was recaptured and again severely beaten. After 6 months in captivity, LTJG Dengler successfully escaped, killing several enemy guards in the process. On the seventeenth day, a pilot who escaped with him was killed, and LTJG Dengler

had to continue alone. Although suffering from malnutrition, jaundice, fatigue, and badly cut and swollen feet, LTJG Dengler refused to give up. Finally, on the twenty-second day after his escape, he managed to lay out a crude SOS on a bed of rocks and attract the attention of a United States Air Force aircraft. Later, a rescue helicopter plucked him to safety and ended his ordeal.

The stories of men who have steadfastly followed both the spirit and letter of Articles III, IV and V of the Code are numerous.

CONCLUSION

We all recognize that full compliance with the laws of armed conflict is not always easy, especially in the confusion and passion of battle. For instance, you might be extremely angry and upset because your unit has taken a lot of casualties from enemy booby traps or hit-and-run tactics. But you must NEVER engage in reprisals or acts of revenge that violate the laws of armed conflict.

CHAPTER 18

FIRST AID AND FIELD SANITATION

This chapter will help you understand the importance of first aid to an injured person and will provide you with an explanation of the first aid measures that you can apply to yourself and to other persons before trained medical personnel arrive. How-to instructions in lifesaving measures are provided for clearing the upper airway, giving artificial ventilation, stopping bleeding, controlling shock, and protecting the wound. In addition, the fundamentals of field sanitation are presented.

First aid is the emergency care given to sick or injured persons. Emergency care must not take the place of proper medical or surgical treatment, but should consist only of furnishing temporary assistance until competent medical aid is available.

The purposes of first aid are (1) to save life, (2) to prevent further injury, and (3) to preserve vitality and resistance to infection.

Everyone in the Navy must know when and how to apply first aid measures. They also must be prepared to give competent assistance to persons injured in battle, collision, fire, and other accidents that may occur on land, sea, or in the air. A real knowledge of first aid and its purposes, when properly applied, can mean the difference between life and death, between rapid recovery and long hospitalization, and between temporary disability and permanent injury.

In administering first aid, you have three primary tasks. They are (1) to maintain breathing, (2) to stop bleeding, and (3) to prevent or reduce shock.

You must work quickly, but don't rush around frantically. Don't waste time looking for ready-made materials, but do the best you can with whatever is at hand. Also, send for medical help as soon as possible.

GENERAL FIRST AID RULES

Although each case of injury or sickness presents its own special problems, there are some general rules that apply to practically all situations. Before proceeding to learn the specific first aid treatment for various types of injuries, you should have a thorough understanding of the following rules.

1. Keep the victim lying down, with his head level with his body, until you have found out what kind of injury the person has and how serious it is. However, if the victim has one of the following problems, you need to place him in a different position.

a. Vomiting or Bleeding About the Mouth and Semiconscious. If the victim is in danger of sucking in blood, vomited matter, or water, place him on his side or back, with his head turned to one side, lower than his feet.

b. Shortness of Breath. If the victim has a chest injury or breathing difficulties, place him in a sitting or semisitting position.

c. Shock. If the victim is in shock, place him on his back with his head slightly lower than his feet. If the injuries permit, the victim's feet should be raised and supported 6 to 12 inches off the deck.

2. In examining the victim, move him no more than is absolutely necessary. You may need to remove some of his clothing to determine the extent of his injuries. Remove enough clothing to get a clear idea of the extent of the injury. If done incorrectly, removing clothing may do great harm, especially in fracture injuries. If necessary, rip or cut clothing along the seams. When clothing is

removed, ensure that the victim does not become chilled. Shoes may have to be cut off to avoid causing pain or increasing an injury.

3. Keep the victim reassured and as comfortable as possible. Often a restoration of confidence is very helpful. Assure the victim that his injuries are understood and that he will get medical attention as soon as possible.

4. Don't touch open wounds or burns with the fingers or other objects except when sterile compresses or bandages are not available and it is absolutely necessary to stop severe bleeding.

5. Don't try to give an unconscious person any solid food or liquid substance by mouth. The victim may vomit and get some of the material into his lungs when he breathes, causing choking. Death could result.

6. If a bone is broken, or if you suspect that one is broken, do not move the victim until you have immobilized the injured part. This may prove lifesaving in cases of severe bone fractures, or spinal cord injuries, because a jagged bone may sever nerves and blood vessels, damage tissues, and increase shock. Of course, the threat of fire and other similar situations may require that the victim be moved. But the principle should always be kept firmly in mind and considered against other factors.

7. When transporting an injured person, always make sure the litter is carried feet forward no matter what injuries the victim has. This will enable the rear bearer to observe the victim for any respiratory obstruction or stoppage of breathing.

8. Keep the injured person comfortably warm—warm enough to maintain normal body temperature.

Very serious and mutilating injuries may require heroic first aid measures on your part. Most injuries, though, will require a minimum of physical effort and a maximum effort of judgment and self-control to prevent you and well-intentioned bystanders from trying to do too much.

Basic life support is a term you have probably heard before. It consists of the emergency techniques for recognizing and treating failures of the respiratory system and heart function. The primary emphasis is placed on maintaining an open AIRWAY to counter upper airway

obstruction; restoring BREATHING to counter respiratory arrest; and restoring CIRCULATION to counter cardiac arrest. These are the ABCs of basic life support. This chapter will attempt to cover some of the essentials of basic life support. Remember: this is not a substitute for a formal course in basic life support. Formal courses, such as those given by the American Red Cross or the American Heart Association, provide hands-on training using manikins. This training is essential for proper execution of the emergency techniques necessary to provide basic life support.

UPPER AIRWAY OBSTRUCTION

Most people who are choking will automatically clutch at their throat. This is recognized as the universal distress signal for upper airway obstruction (see fig. 18-1). The most common cause of upper airway obstruction in a conscious person is improperly chewed food.

PARTIAL OBSTRUCTION. If the victim coughs, or if there is adequate air exchange, encourage the victim to continue with his own

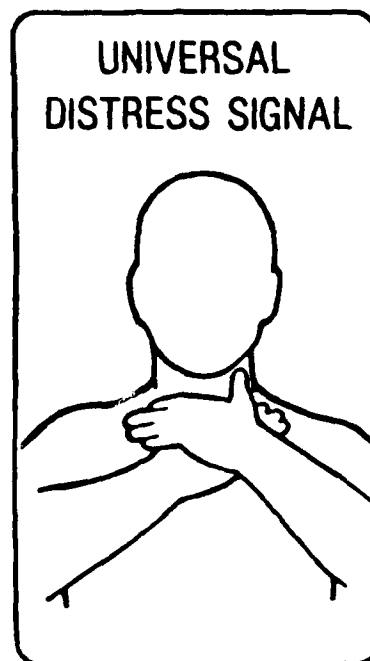


Figure 18-1.—Universal distress signal.

efforts to expel the foreign body. Do not interfere with the victim's efforts to remove the obstruction. Observe the victim closely for increased distress, and be prepared to treat for a completely blocked airway.

If there is inadequate air exchange, which is indicated by a weak or ineffective cough, high-pitched noises while the victim attempts to inhale, and bluish discoloration of the skin (especially around the nails and lips), handle the problem as if it were a complete airway obstruction.

COMPLETE AIRWAY OBSTRUCTION. Complete airway obstruction is indicated by no air exchange and an inability to speak, cough, or breathe. If the victim is conscious, he may exhibit the universal distress signal, as identified above.

If the victim is unconscious, check for breathing. If the victim is not breathing, the tongue or some other object may be blocking the air passage. The airway may be opened by tilting the head back and lifting the neck or chin. Or if the head should not be moved, in the case of neck injuries, the jaw may be thrust forward. These techniques are described below.

HEAD TILT-NECK LIFT

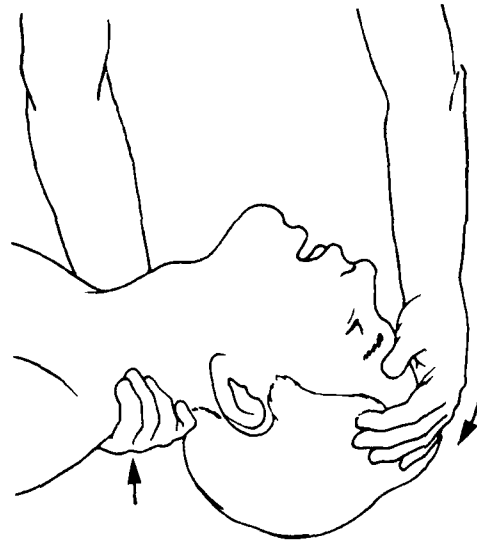
The head tilt-neck lift technique is performed with the victim lying face up and the rescuer kneeling at the victim's side, next to the victim's head and neck. Apply pressure on the forehead and at the same time lift the neck. Tilting the head in this manner, which is shown in figure 18-2, opens the airway.

HEAD TILT-CHIN LIFT

The head tilt-chin lift may be successful in opening an airway when the head tilt-neck lift is not. The lower jaw is supported by lifting the chin. The fingertips of one hand are placed under the lower jaw on the bony part near the chin, bringing the chin forward, supporting the jaw, and helping to tilt the head back. Avoid putting too much pressure under the chin, as this may cause obstruction of the airway. Press on the victim's forehead with the free hand to tilt the head back.

JAW THRUST

Yet another technique for opening the airway is the jaw thrust. This technique is accomplished by kneeling by the top of the victim's head and placing your fingers behind the angles of the lower



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Figure 18-2.—Head tilt-neck lift.

jaw, or hooking your fingers under the jaw, then bringing the jaw forward. Separate the lips with your thumbs, to allow breathing through the mouth as well as the nose, as illustrated in figure 18-3. This technique is to be used if a neck injury is suspected. Note that the head is not tilted.

Any of these techniques will offer some relief for most forms of airway obstruction. They also prepare the way for artificial ventilation.

After having opened the airway, check the mouth for mucus, food particles, foreign objects, or loose dentures. If present, open the victim's mouth and clear away the matter by inserting a



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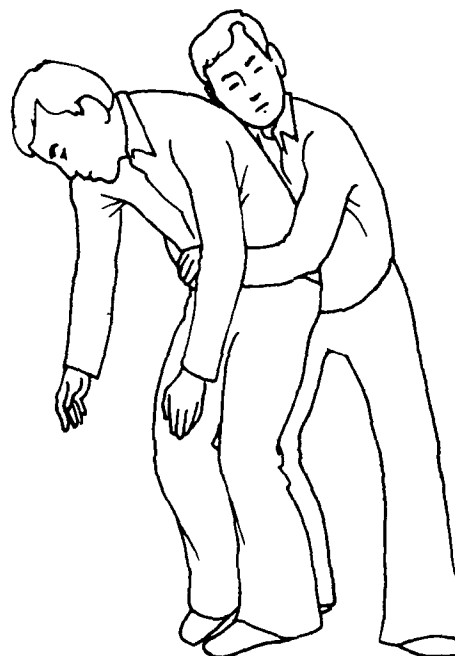
Figure 18-3.—Jaw thrust.

finger into the mouth and gently sweeping from the inside of one cheek to the other. Be careful not to force the material into the victim's throat. Next, reposition the victim's head, ensuring an open airway, and place your ear next to the victim's nose and mouth. While in this position, listen and feel for air exchange, and look at the victim's chest and abdomen for movement.

If the airway is still obstructed, it may be necessary to try to remove the obstruction by using the back blow, abdominal thrust, or chest thrust methods.

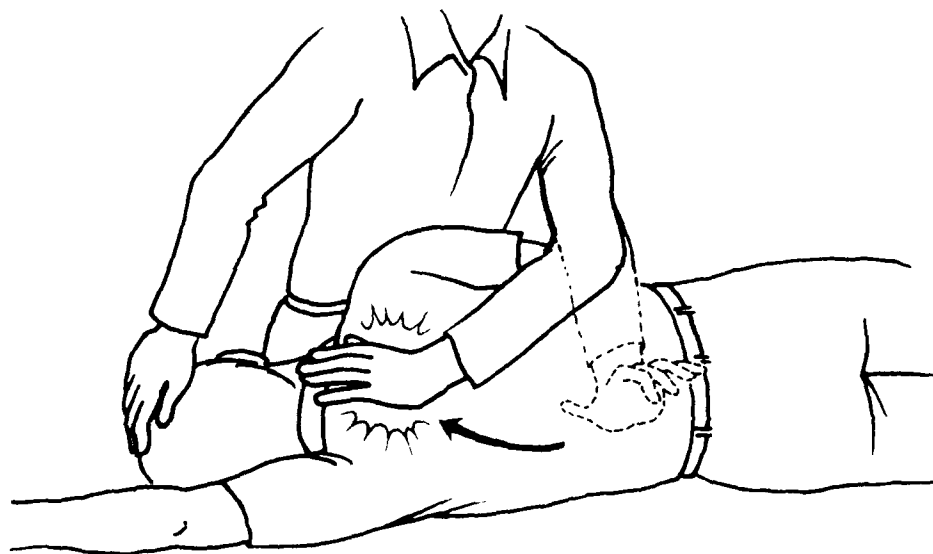
BACK BLOWS

If the victim is conscious, explain what you are going to do. If he is sitting or standing, place your arm around the waist for support. Bend him over to use the force of gravity, and with the heel of your hand, sharply strike the victim on the back between the shoulder blades. Give four sharp blows while the victim attempts to cough up the obstruction, working with the attempts at coughing rather than against. If the victim is lying down, kneel and roll the victim on his side toward you until the victim's abdomen is resting against your knees. Then administer the open hand blows to the back, as illustrated in figure 18-4.



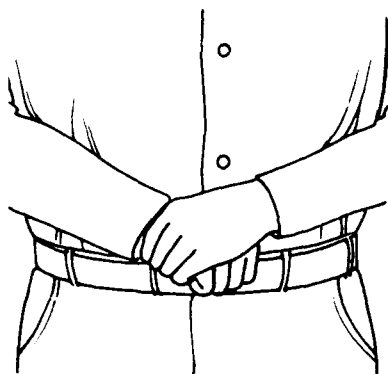
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Figure 18-5.—Position for standing abdominal thrust.



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Figure 18-4.—Back blow technique to clear airway.



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Figure 18-6.—Correct hand positioning.

For infants or small children, support the child straddled over your forearm, allowing the head to be supported by your hand in a downward position. The back blows are then delivered with the free hand.

ABDOMINAL THRUST

If the back blows are unsuccessful, use the abdominal thrust. This procedure pushes air from the lungs and forces the object from the air passage.

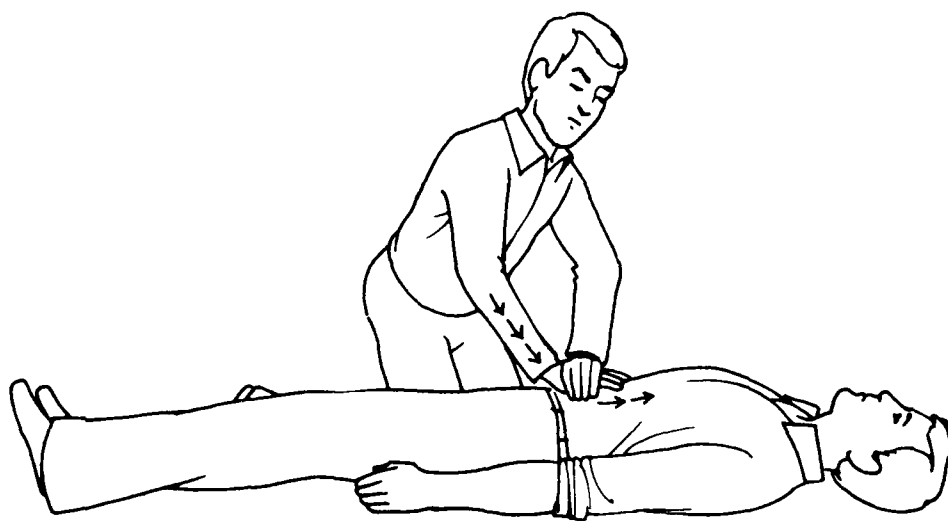
ABDOMINAL THRUST STANDING TECHNIQUE

1. Stand behind the victim, and wrap your arms around the victim's waist, as illustrated in figure 18-5.
2. Make a fist with one hand, and place it thumb side against the abdomen, slightly above the navel.
3. Grasp the fist with the other hand (fig. 18-6).
4. Give four quick upward thrusts to the victim. The obstruction should pop out like a champagne cork.

ABDOMINAL THRUST RECLINING TECHNIQUE

This technique is performed with the victim lying flat, face up.

1. Position yourself for the thrust by straddling the victim at the hips or kneeling beside the victim's hips.
2. Place the heel of one hand on top of the other, slightly above the navel, with the fingers pointing toward the head.
3. Give four quick, upward thrusts to the abdomen, as shown in figure 18-7.



136.57

Figure 18-7.—Position for reclining abdominal thrust.

Following the cycle of four back blows and four abdominal thrusts, turn the victim's head to the side, and check for loose foreign matter with a sweeping movement of the index finger inside the mouth. Repeat cycles of four back blows, four abdominal thrusts, and finger sweeps until the obstruction is dislodged or until a rescue team arrives.

CHEST THRUSTS

For obese or pregnant victims, the chest thrust method is recommended for removing airway obstructions, since manual pressure to the abdominal area of these people would either be ineffective or cause internal damage.

CHEST THRUST STANDING TECHNIQUE

1. Bring your arms under the arms of the victim, and encircle the lower chest, as depicted in figure 18-8.
2. Position your hands as described for the abdominal thrust standing technique.
3. Keep your fist on the middle of the sternum (breastbone), not the lower part.
4. Apply pressure to the chest with quick, backward thrusts.



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Figure 18-8. Position for standing chest thrust.

CHEST THRUST RECLINING TECHNIQUE

This technique is performed with the victim lying flat, face up.

1. Kneel at the victim's side.
2. Place the heel of one hand on the middle of the sternum, and cover with the other hand, keeping your fingers off the chest.
3. Give four downward thrusts.
4. Repeat cycles of back blows, chest thrusts, and finger sweeps following the same technique you would use with abdominal thrusts.

SELF-HELP FOR AIRWAY OBSTRUCTION

If you are alone and you are the victim of an airway obstruction, don't be afraid, for you can help yourself. Using your own fist, you can perform the abdominal thrust standing technique, or you can use the back of a chair to exert abdominal pressure. See figure 18-9.

PROCEDURE FOR:



Figure 18-9. Procedure for self-help.

BREATHING

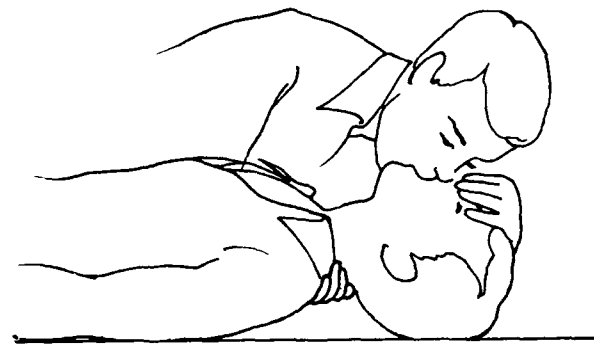
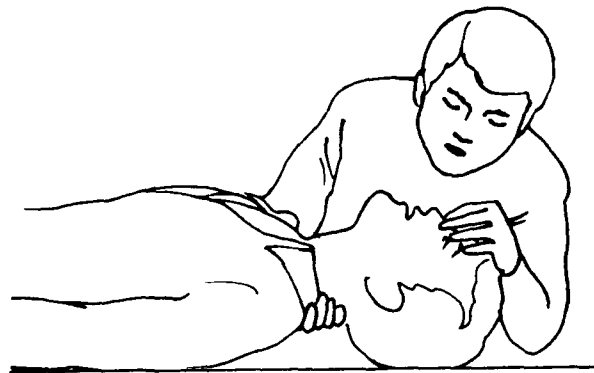
The second aspect of basic life support is to restore breathing in cases of respiratory arrest (the victim has stopped breathing). Failure of the breathing mechanism may be caused by various factors. They include complete airway obstruction, acute trauma, suffocation, electric shock, drowning, and drug overdose. Unless something is done when the victim is not breathing, the heart will soon stop beating. In such instances, be prepared to start cardiopulmonary resuscitation (CPR).

The signs of respiratory arrest are an absence of respiratory effort, a lack of detectable air movement through the nose or mouth, unconsciousness, and a bluish discoloration of the lips and nail beds.

ARTIFICIAL VENTILATION

The purpose of artificial ventilation is to provide a method of air exchange until natural breathing is reestablished. Artificial ventilation should be given only when natural breathing has stopped; it must not be given to any person who is breathing naturally. Do not assume that a person's breathing has stopped merely because the person is unconscious or has been rescued from the water, from poisonous gas, or from contact with an electric wire. Remember: **DO NOT GIVE ARTIFICIAL VENTILATION TO A PERSON WHO IS BREATHING NATURALLY.**

In the last section we discussed the methods to open the blocked airway. When the victim is not breathing, it is essential that the airway is open so the rescuer can begin respiratory life support. If the victim does not begin spontaneous breathing after opening the airway, begin artificial ventilation immediately. If ventilation is inadequate, readjust the head, using one of the methods described earlier and attempt to ventilate again. If the airway is obstructed, use the back blow and thrust techniques



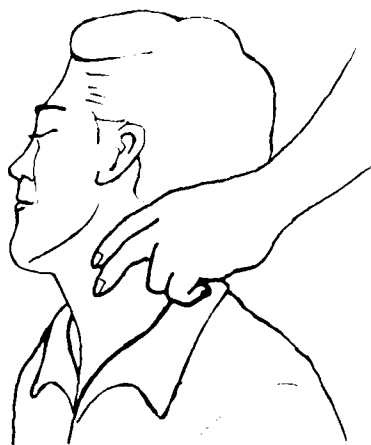
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Figure 18-10.—Mouth-to-mouth ventilation.

discussed previously, followed by another attempt at artificial ventilation.

Mouth-to-Mouth Ventilation

To perform mouth-to-mouth ventilation, place one hand under the victim's neck, and place the heel of the other hand on the forehead, using the thumb and index finger to pinch the nostrils shut. Tilt the head back to open the airway. Take a deep breath, cover the victim's mouth with your own, and blow into the victim's mouth (fig. 18-10). Briefly remove your mouth from the victim's mouth to allow exhalation. Initially, give four quick breaths in succession, allowing the lungs to only partially deflate. Observe



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Figure 18-11.—Feeling for the carotid pulse.

the victim's chest for movement. Check the victim's neck pulse (carotid artery), as depicted in figure 18-11. If a pulse is present, continue rescue breathing at the rate of 12 ventilations per minute (one breath every 5 seconds).

For infants (less than 1 year), seal both the mouth and nose with your mouth. Open the airway, using the head tilt-chin lift method, and be careful not to overextend the neck. Give enough air to make the chest rise, but take care not to overventilate and cause lung damage. Check the infant's upper arm pulse (brachial artery), illustrated in figure 18-12. If a pulse is present, continue rescue breathing.

Mouth-to-Nose Ventilation

Mouth-to-nose ventilation is effective when the victim has extensive facial or dental injuries; this permits an effective air seal.

To administer this method, seal the victim's mouth with your hand, take a deep breath, and place your lips over the victim's nose and blow. To assist the victim to exhale, you may open the lips. Start artificial ventilation with four quick breaths in succession, allowing the lungs to only partially deflate. Check the victim's neck pulse. If a pulse is present, continue rescue breathing at the rate of 12 ventilations per minute (one breath every 5 seconds).

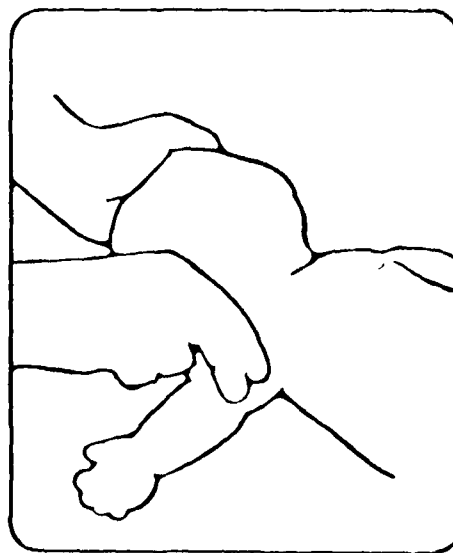


Figure 18-12.—Feeling for the brachial pulse.

Mask-to-Mouth Ventilation

There may be times when you will be required to perform artificial ventilation in a contaminated environment, such as on a battlefield after a chemical or biological warfare attack. The mask-to-mouth method of artificial ventilation is a modification of the mouth-to-mouth method. A special resuscitation tube is used to deliver uncontaminated air to a casualty. This resuscitation tube has an adapter at one end that attaches to the mask of the rescuer and a molded-rubber mouthpiece at the other end for the mouth of the casualty.

Back-Pressure Arm Lift

The back-pressure arm lift method is a less effective technique used when other methods are not feasible, such as on a battlefield, where gas masks must be worn.

1. Place the victim in the prone position, face to one side, and neck hyperextended with the hands under the head. See figure 18-13, view A. Quickly clear the mouth of any foreign matter.
2. Kneel at the victim's head and place your hands on the back so the heels of your hands lie

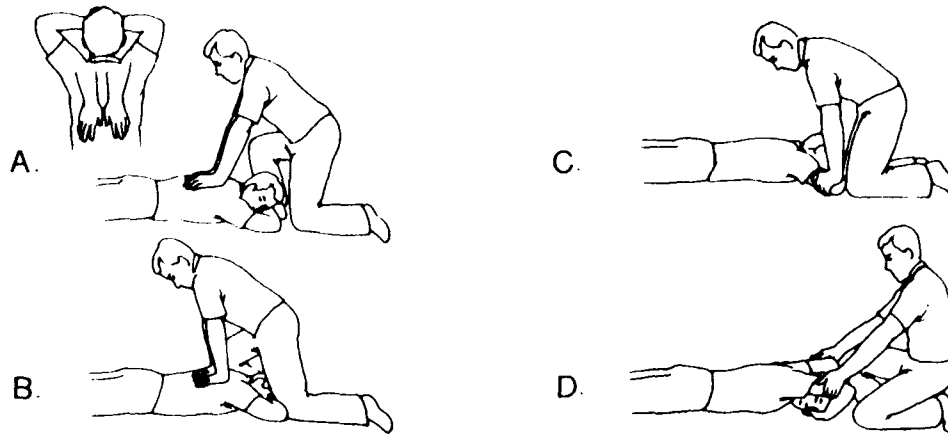


Figure 18-13.—Back-pressure arm lift.

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just below a line between the armpits, with thumbs touching and fingers extending downward and outward (fig. 18-13, view B).

3. Rock forward, keeping your arms straight and exert pressure almost directly downward on the victim's back, forcing air out of the lungs.

4. Then rock backward, releasing the pressure and grasping the arms just above the elbows (fig. 18-13, view C).

5. Continue to rock backward, pulling the arms upward and inward (toward the head) until resistance and tension in the shoulders are noted (fig. 18-13, view D). This pulling action expands the chest causing active intake of air (inspiration). Rock forward and release the victim's arms. This causes passive exiting of air (expiration).

Repeat the cycle of press, release, lift, and release 12 times a minute until the victim can breathe spontaneously.

Gastric Distention

Sometimes during artificial ventilation air enters the stomach instead of the lungs and the abdomen appears bloated. This condition is called gastric distention. If gastric distention develops, open the airway even more and cut down on the amount of air you are giving, BUT DO NOT attempt to expel stomach contents by pushing on the abdomen. If the patient vomits while you are

giving mouth-to-mouth ventilation, turn his head to one side and clear the airway.

CIRCULATION

Cardiac arrest is the stoppage of heart function. If the victim is to live, take action immediately to restore heart function. The signs of cardiac arrest include the absence of a pulse, because the heart is not beating, and the absence of breathing.

A rescuer who knows how to administer cardiopulmonary resuscitation (CPR) increases the chances of a victim's survival. CPR consists of artificial ventilations and external heart compressions. The lungs are ventilated by the mouth-to-mouth or mouth-to-nose techniques; the compressions are performed by pressing the chest with the heel of your hands. The victim should be laying face up on a firm surface.

CPR should not be attempted by a rescuer who has not been properly trained, as mentioned earlier in this chapter. To learn this technique, contact your medical education department.

ONE-RESCUER TECHNIQUE

The rescuer must not assume that an arrest has occurred solely because the victim is lying on the deck and appears to be unconscious. First, try to

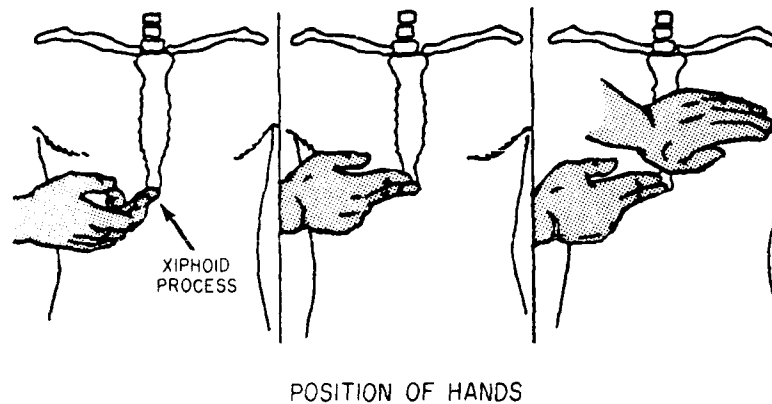


Figure 18-14.—Xiphoid process.

arouse the victim by gently shaking the shoulders and trying to obtain a response; loudly ask, "Are you OK?" Be careful if the victim shows signs of head and spinal injuries. If there is no response, place the victim face up on a firm surface. Kneel at a right angle to the victim, and open the airway, using the head tilt-neck lift, the head tilt-chin lift, or the jaw thrust methods previously discussed. Look for chest movements. Listen and feel for air coming from the nose or mouth for at least 5 seconds. If the pulse is absent, call for help and begin CPR.

Locate the lower margin of the victim's rib cage on the side closest to you by using your middle and index fingers. Then move your fingers up along the edge of the rib cage to the notch (xiphoid process) where the ribs meet the sternum in the center of the lower chest. The middle finger is placed on the notch, and the index finger is placed next to it. The heel of the other hand is placed along the midline of the sternum, next to the index finger. You must keep the heel of your hand off the xiphoid process (fig. 18-14). A fracture in this area could lacerate the liver.

Place the heel of one hand directly on the lower half of the sternum two fingers up from the notch, and the heel of the other on top of the first hand. Interlock your fingers or extend them straight out, and **KEEP THEM OFF THE VICTIM'S CHEST!** See figure 18-15.

With the elbows locked, apply vertical pressure straight down to depress the sternum (adult) from 1 1/2 to 2 inches. Then release the pressure,

keeping the heels of the hands in place on the chest. This process compresses the heart between the sternum and the victim's back, thus pumping blood to the vital parts of the body.

If you use the proper technique, a more effective compression will result, and you will feel less fatigue. Ineffective compression occurs when the elbows are not locked,

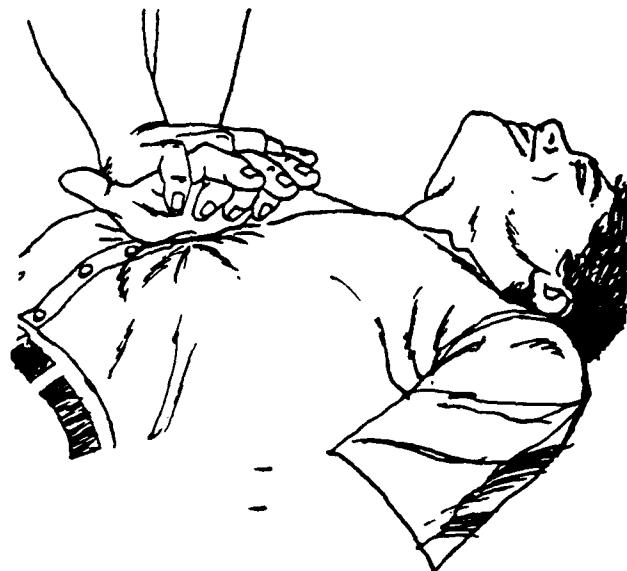


Figure 18-15.—Interlocking fingers to help keep fingers off the chest wall.

the rescuer is not directly over the sternum, or the hands are improperly placed on the sternum.

When one rescuer performs CPR, the ratio of compressions to ventilations is 15 to 2, and it is performed at a rate of 80 compressions per minute. Vocalize "1, and 2, and 3," and so forth until you reach 15. After 15 compressions, you must give the victim 2 ventilations. Continue for 4 full cycles of 15 compressions and 2 ventilations. Then take 5 seconds to check for the carotid pulse and spontaneous breathing. If there are still no signs of recovery, continue CPR. If a periodic check reveals a return of pulse and respiration, discontinue CPR; but closely monitor the victim's pulse and respirations, and be prepared to start CPR again if required. If a pulse is present but no respiration, continue to give the victim one ventilation every 5 seconds and check the pulse frequently.

Before moving on to the next technique, let us review the steps for one-rescuer CPR.

1. Determine whether the victim is conscious.
2. Open the airway (it may be necessary to remove the airway obstruction).
3. Look, listen, and feel.
4. Ventilate four times.
5. Check the pulse—if none, call for help.
6. Begin the compression-ventilation ratio of 15 to 2 for four complete cycles.
7. Check again for a pulse and breathing. If no change, continue the compression-ventilation ratio of 15 to 2 until the victim is responsive, until you are properly relieved, until you can no longer continue because of exhaustion, or until the victim is pronounced dead by a medical officer.

TWO-RESCUER TECHNIQUE

If there are two people trained in CPR on the scene, one must perform compressions while the other performs ventilations. The ratio for two-person CPR is 5 compressions to 1 ventilation, at a rate of 60 compressions per minute. One rescuer is positioned at the chest area and the other beside the victim's head. The rescuers should be on opposite sides of the victim to ease position changes when one rescuer gets tired. When CPR is started, the compressions should be given in a constant, methodical rhythm. The rescuer giving

the compressions counts them out loud: "One one-thousand, two one-thousand, three one-thousand," and so forth, thus giving the proper 60 compressions per minute rate. On the upstroke of the fifth compression, the rescuer at the head of the victim provides mouth-to-mouth ventilation. The rescuer giving the compressions does not stop while the ventilation is taking place. Timing is important. To inflate the lungs, ventilation must be given on the upstroke of the compression.

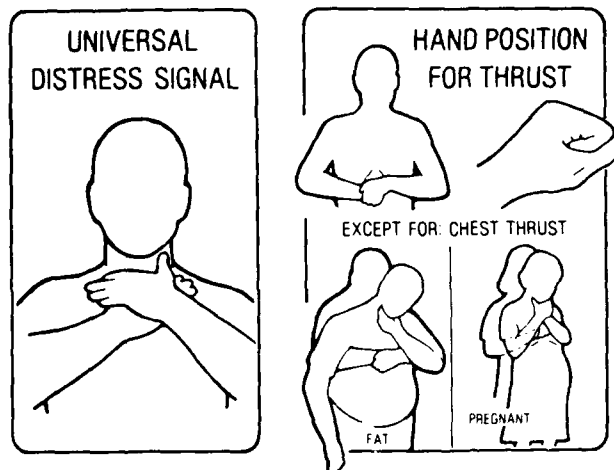
Often the rescuer performing chest compressions will tire. It is then appropriate for the two rescuers to change positions. Changes should be made on cue without interrupting the rhythm. The rescuer at the chest activates the change. The rescuer initiates the change with the command: "Change one-thousand (vice one one-thousand) which is followed by "two one-thousand, three one-thousand," and so forth. After five one-thousand, the ventilator gives the breath at the head and moves to the chest to start compressions when instructed. The person who was compressing the chest also moves at the same time to the head. This person opens the victim's airway and checks the carotid pulse for 5 seconds. If no pulse is present, the rescuer states, "No pulse, continue CPR" and gives a breath. The person at the chest then begins compressions. Continue until the victim is responsive, until you are properly relieved, or until the victim is pronounced dead by a medical officer.

ONE-RESCUER CPR CHANGING TO TWO-RESCUER CPR

When a person is administering CPR and another person who knows CPR approaches, the approaching person should tell the rescuer that he knows CPR and that he can help. The first rescuer will indicate when he is ready to change to the two-rescuer technique; the second rescuer must then check the victim's carotid pulse. At this point, the two rescuers should be on opposite sides of the victim.

A pulse should be felt during compressions if the compressions are being done correctly. If no pulse is felt, the compression technique should be reevaluated. If a pulse is felt, the second rescuer should call, "Stop compression." The first rescuer should then stop compressing for 5 seconds so the

DEFINITIONS



PROCEDURE

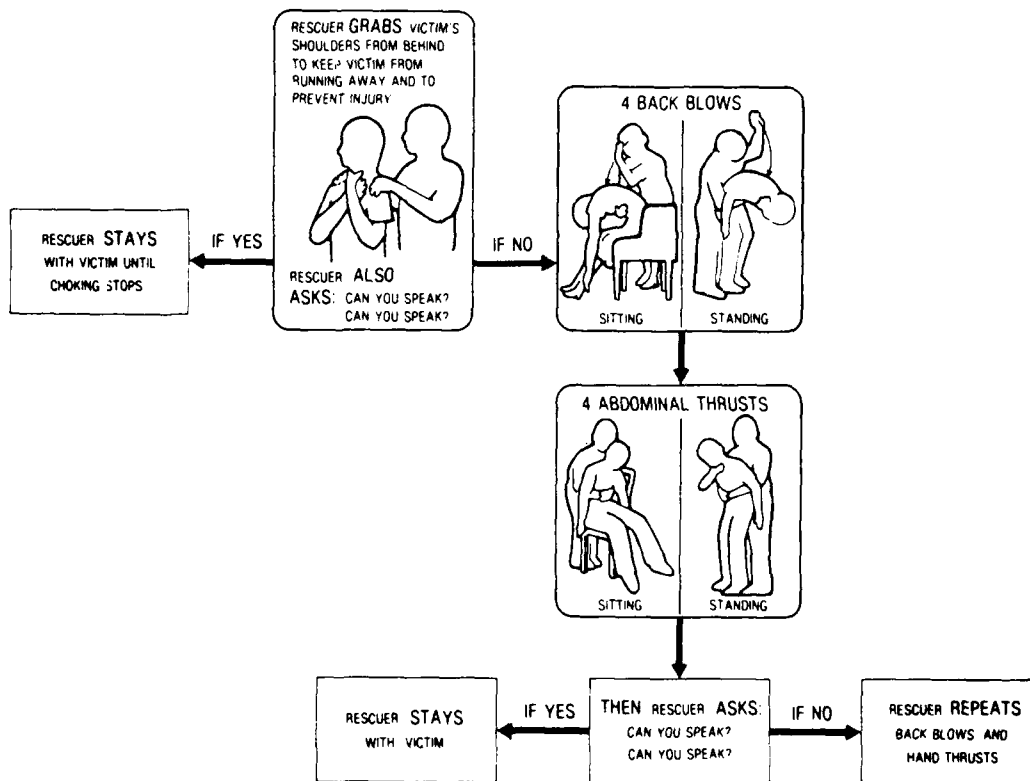


Figure 18-16.—Choking procedures.

second rescuer can determine whether the victim has a spontaneous pulse. If no pulse is felt, the two rescuers should begin performing two-rescuer CPR, as described above.

CPR FOR CHILDREN AND INFANTS

Cardiopulmonary resuscitation for children and infants is similar to that for adults. The primary difference is that, for children, the heel of one hand is used to depress the middle of the sternum from 1 to 1 1/2 inches. For infants, only two fingers are used to depress the middle of the sternum from 1/2 to 1 inch. For children, the compression rate increases to 80 compressions per minute. The ratio of compressions to ventilations is 5 to 1. This ratio remains the same for both one- and two-rescuer CPR. For infants, the rate is increased to 100 compressions per minute. Because of an infant's small size, it is more effective for one rescuer to perform both chest compressions and ventilations. The ratio is 5 compressions to 1 ventilation, as with children and two-rescuer CPR. As stated earlier, the presence or absence of a pulse is determined by using the brachial artery (fig. 18-12). Keep in mind that strong ventilations can damage a child's lungs.

For CPR purposes, an infant is a small child up to 1 year of age, a child is from 1 to 8 years of age, and an adult is 8 years of age and beyond. Your judgment will sometimes be necessary when you are evaluating some of the victims because of their size.

The diagrams in figures 18-16 through 18-19 illustrate the step-by-step methods discussed in this chapter and will serve as a good review.

TRANSPORTATION OF SICK AND INJURED

Knowing how to transport a seriously injured casualty is one of the most important parts of first aid. Careless or rough handling not only may increase the seriousness of his injury but also may cause his death. Unless there is a good reason for

transporting a casualty, do not do so until some means of medical evacuation is provided. Sometimes when the situation is urgent and you know that no medical evacuation facilities are available, you will have to transport the casualty yourself. That is why you should know the different ways of transporting a casualty. Give the appropriate first aid before leaving with him. If he has a broken bone, do not transport him until you have splinted or immobilized the part.

Do not transport a casualty with a fractured back or neck without a litter. If the casualty has a fracture of any other part, transport him in a way that will not aggravate the fracture. An unconscious casualty should be transported on a litter or carried in such a way that he will not fall. Transportation by litter is safer and more comfortable for all casualties as well as easier for you. If carrying the casualty is the only feasible method because of the terrain or the combat situation or is necessary to save the casualty's life, it should be used; but the casualty should be transferred to a litter as soon as one can be made available or improvised.

IMPROVISED LITTERS

A litter can be improvised from many different things. Most flat-surface objects of suitable size can be used as litters. Such objects include boards, doors, window shutters, benches, ladders, cots, and poles tied together. If possible, such objects should be padded.

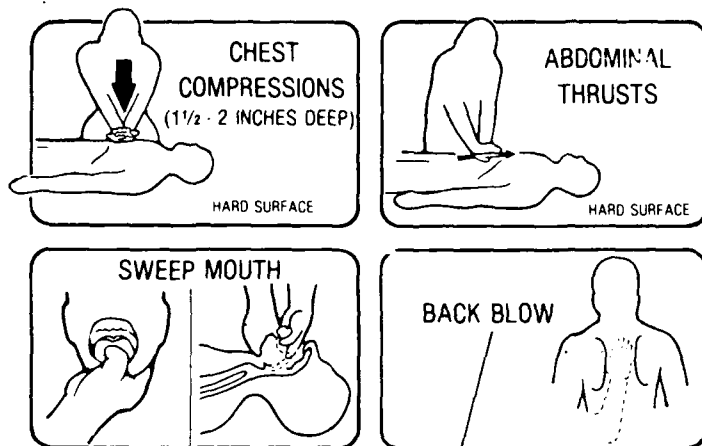
Satisfactory litters can be also made by securing poles inside such items as blankets, shelter halves, tarpaulins, jackets, shirts, sacks, bags, and mattress covers. Poles can be improvised from strong branches, rifles, tent supports, skis, and other items.

CAUTION: If weapons are used as splints, be absolutely sure they are unloaded.

If no poles can be obtained, a large item such as a blanket can be rolled from both sides toward the center; then the rolls can be used to obtain a firm grip when carrying the casualty. Several methods of improvising litters are illustrated and explained in figures 18-20 through 18-22.

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DEFINITIONS



Although the value of this procedure has been questioned, it is used because it is currently part of a generally accepted routine. AHA Standards 1980 (See JAMA, Vol 244, No. 5, Aug 1, 1980, pp 453-512)

PROCEDURE

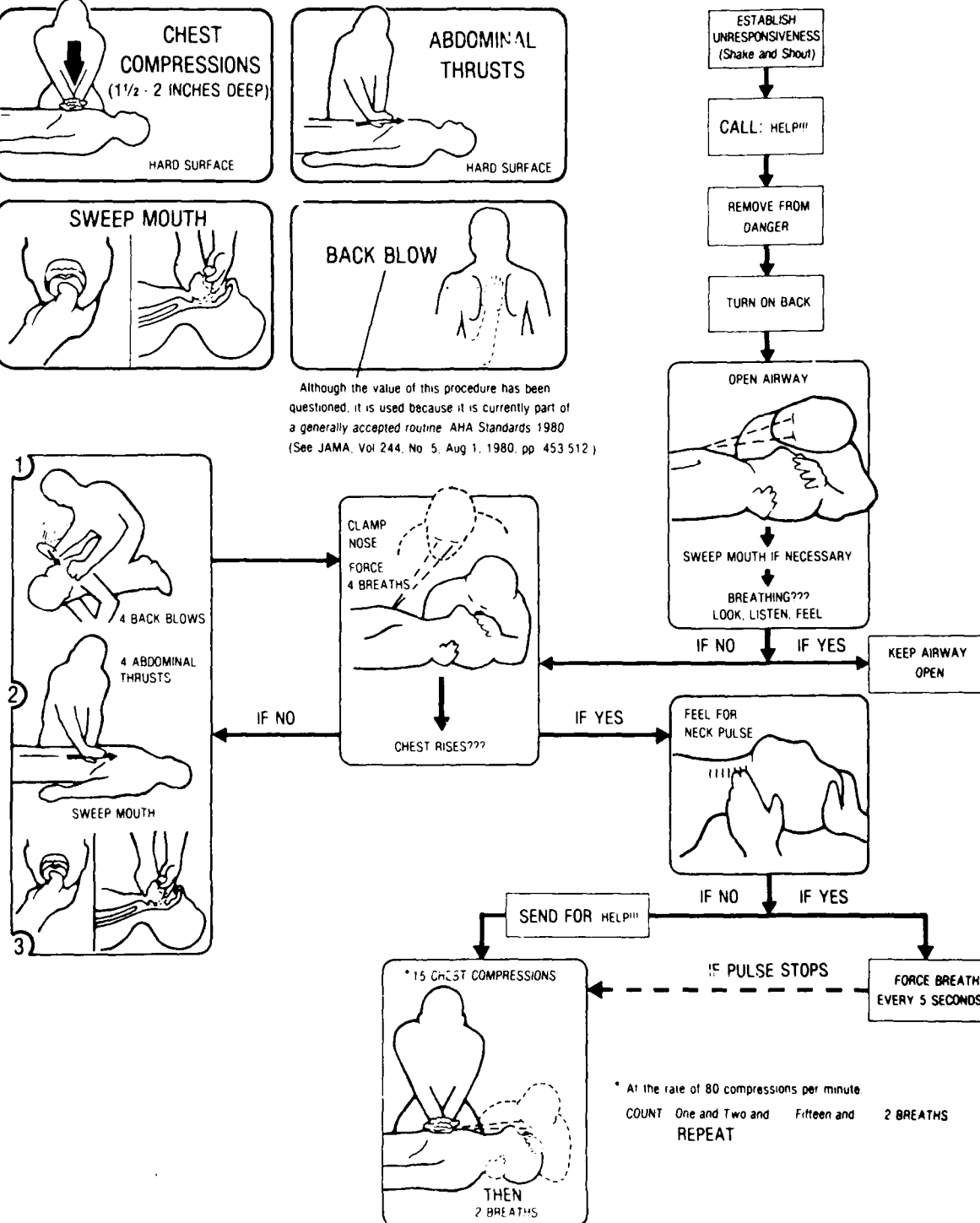


Figure 18-17.—One-rescuer CPR.

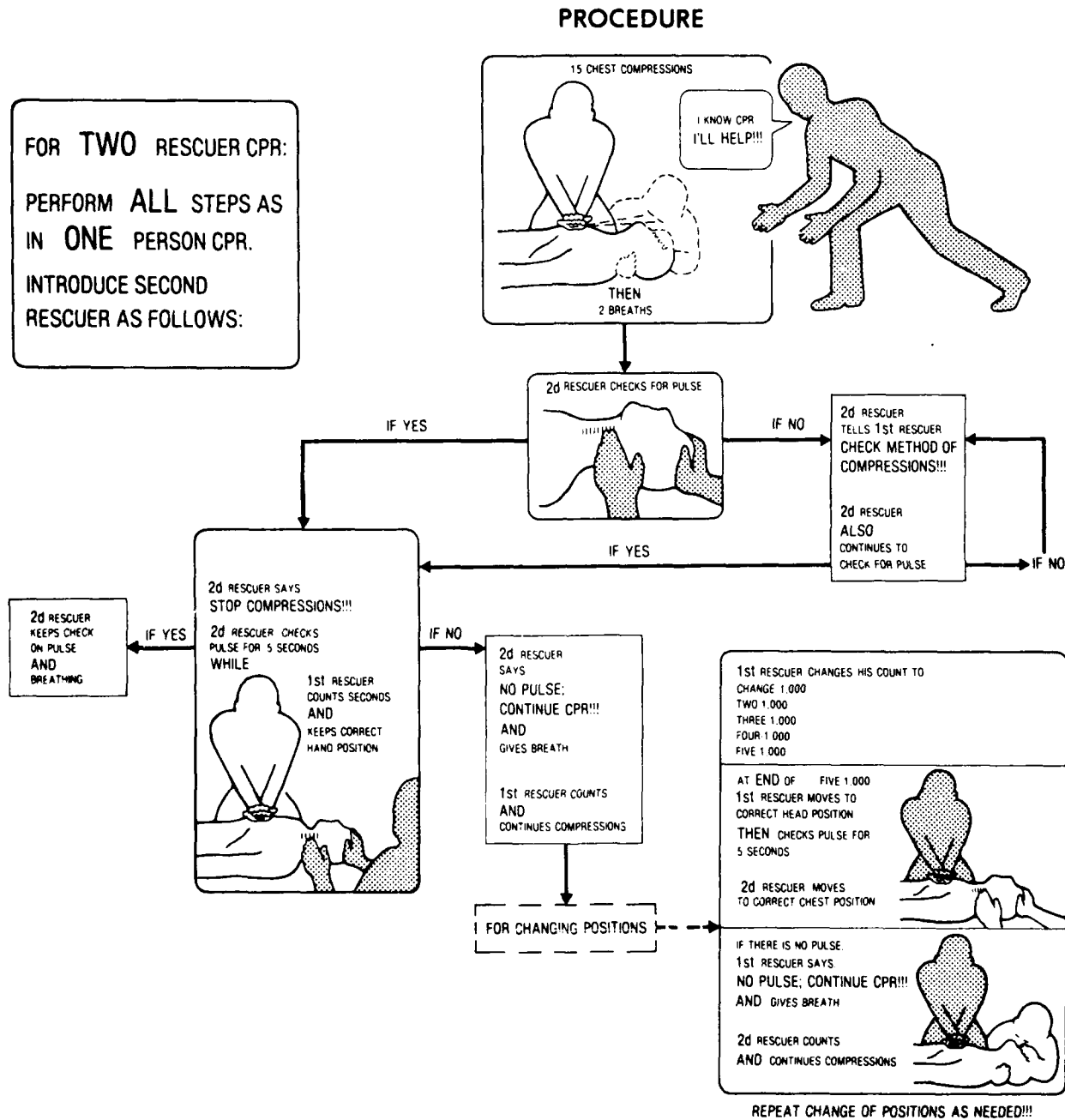


Figure 18-18.—Two-rescuer CPR.

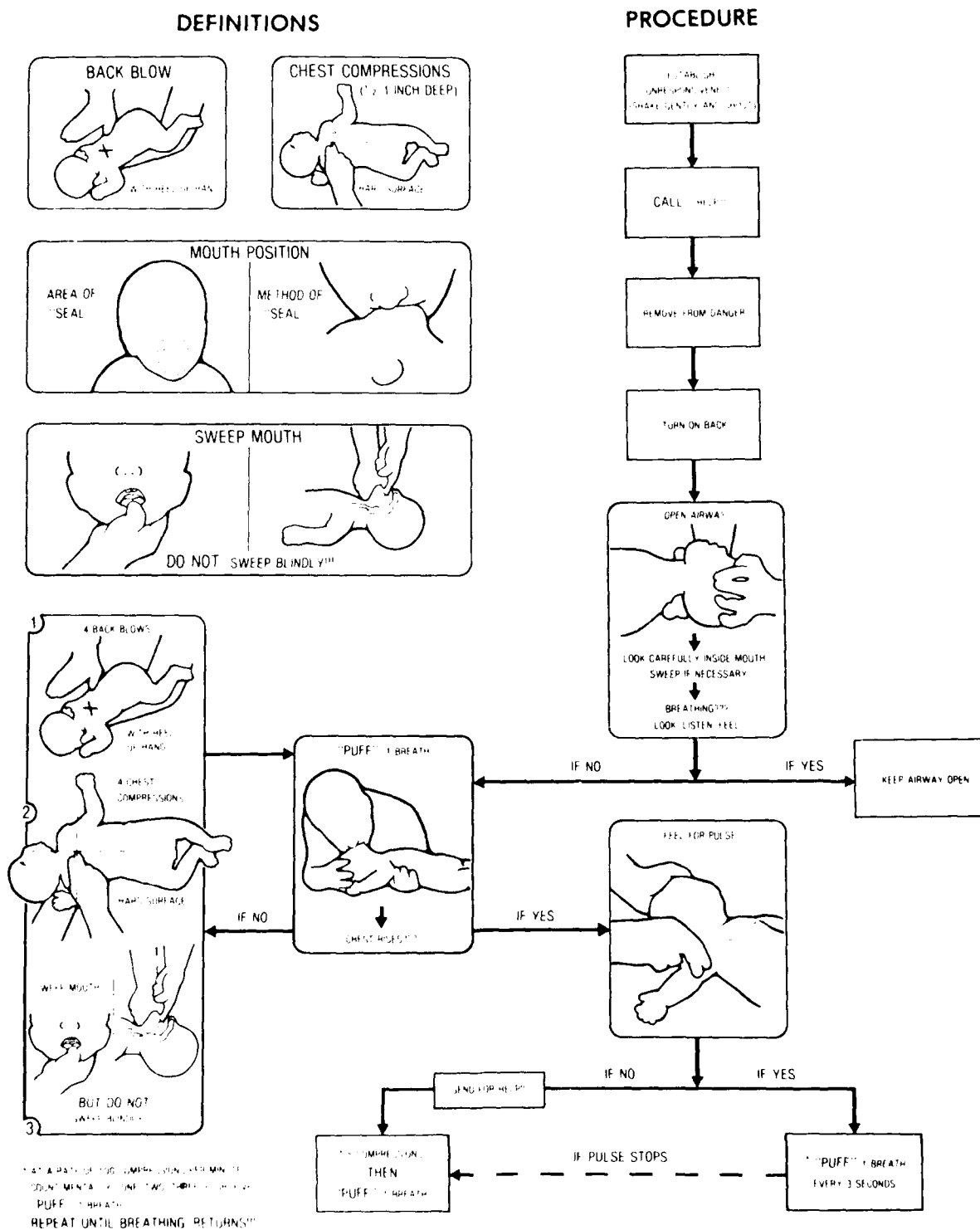
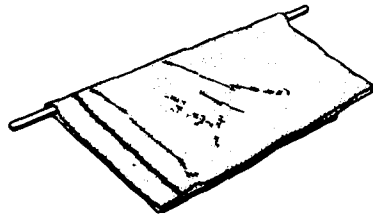
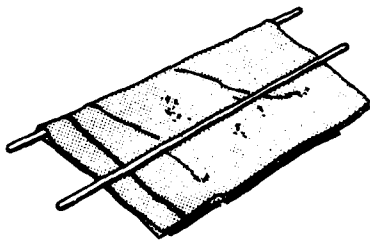


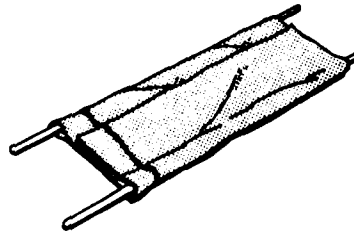
Figure 18-19.—Infant CPR.



- A. OPEN THE BLANKET AND LAY ONE POLE LENGTHWISE ACROSS THE CENTER; THEN FOLD THE BLANKET OVER THE POLE.



- B. PLACE THE SECOND POLE ACROSS THE CENTER OF THE FOLDED BLANKET.

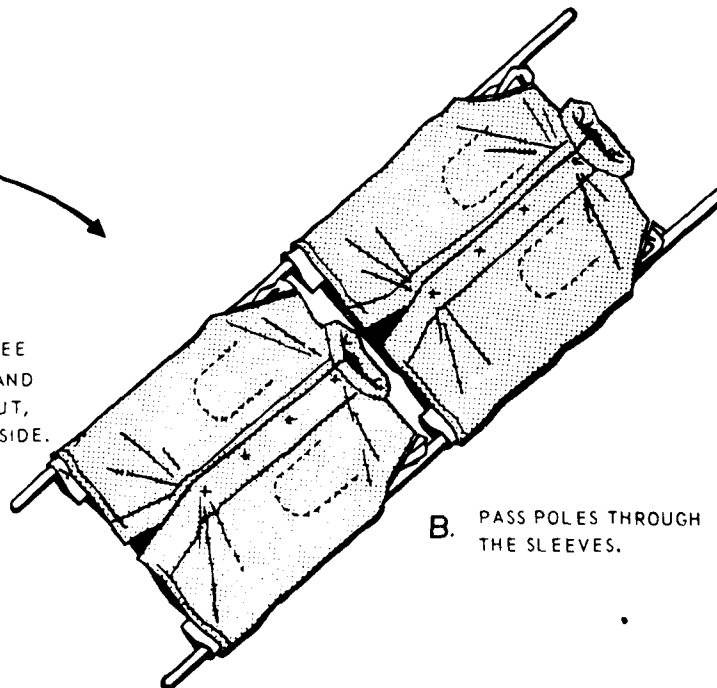


- C. FOLD THE FREE EDGES OF THE BLANKET OVER THE SECOND POLE.

Figure 18-20.—Litter made with poles and blanket.



- A. BUTTON TWO OR THREE SHIRTS OR JACKETS AND TURN THEM INSIDE OUT, LEAVING SLEEVES INSIDE.



- B. PASS POLES THROUGH THE SLEEVES.

Figure 18-21.—Litter made with poles and jackets.

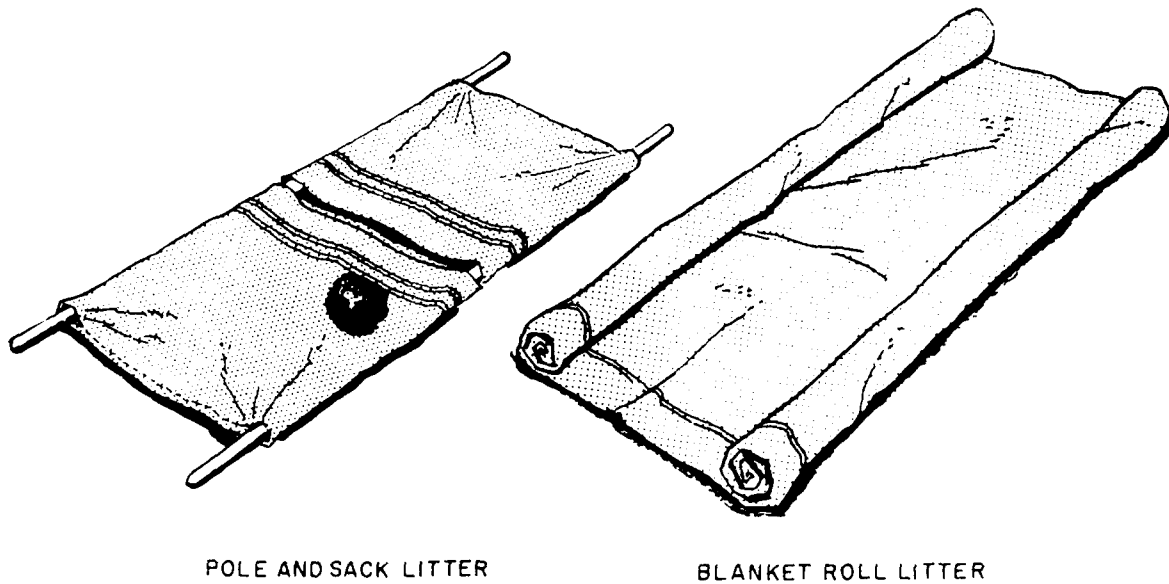


Figure 18-22.—Litters made by inserting poles through sacks and by rolling blanket.

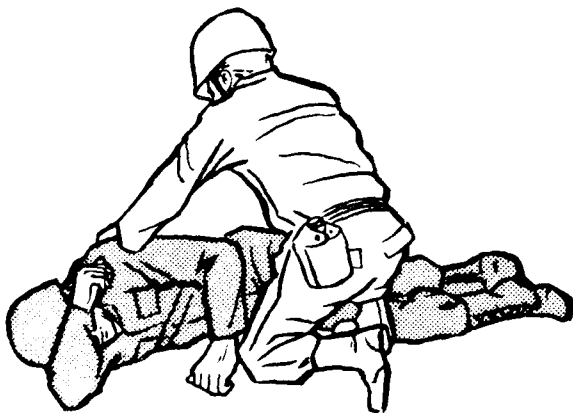
METHODS OF CARRYING A CASUALTY

A casualty may be transported by using one-man and two-man carries. The two-man carries should be used whenever possible, as they provide more comfort to the casualty, are less likely to aggravate his injury, and are less tiring to the carriers. The particular one-man or two-man carry selected for use should be the one that is least likely to aggravate the casualty's injury.

Fireman's Carry

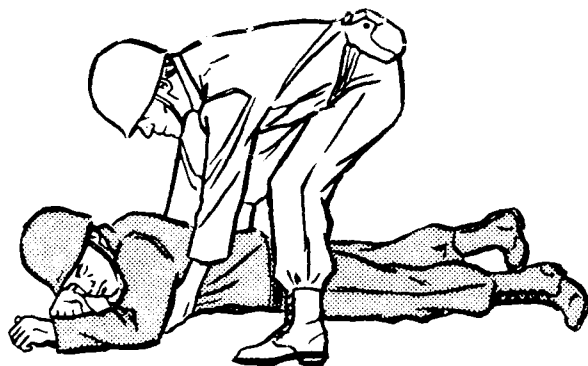
This method is one of the easiest ways for one man to get a casualty off the ground and to carry him. Figures 18-23 through 18-27 illustrate the steps in the fireman's carry.

The steps (two, three, and four) for getting the casualty off the ground may be accomplished in one of two ways, depending upon the location of the casualty's injury. The carrier should decide which method would be better for the casualty. Furthermore, the carrier should bring the casualty onto his back from the side that will avoid pressure on the injured part.

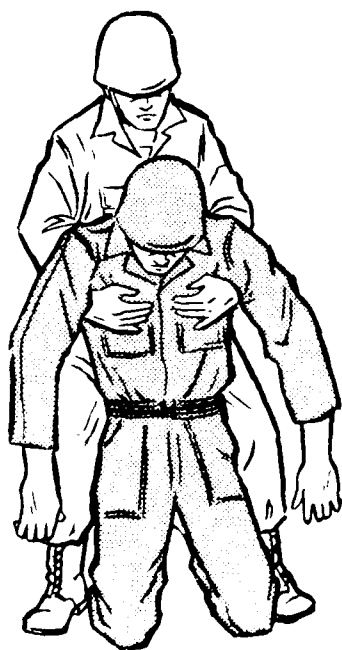


STEP ONE: IF THE CASUALTY IS LYING ON HIS BACK, KNEEL AT HIS UNINJURED SIDE, PLACE ONE OF HIS ARMS ACROSS HIS FACE, AND GENTLY ROLL HIM TOWARD YOU ONTO HIS ABDOMEN. HIS ARM PROTECTS HIS FACE FROM THE GROUND.

Figure 18-23.—Fireman's carry (step one).



STEP TWO: STRADDLE THE CASUALTY AND GRASP HIM BY EXTENDING YOUR HANDS UNDER HIS ARMPITS AND AGAINST HIS CHEST.

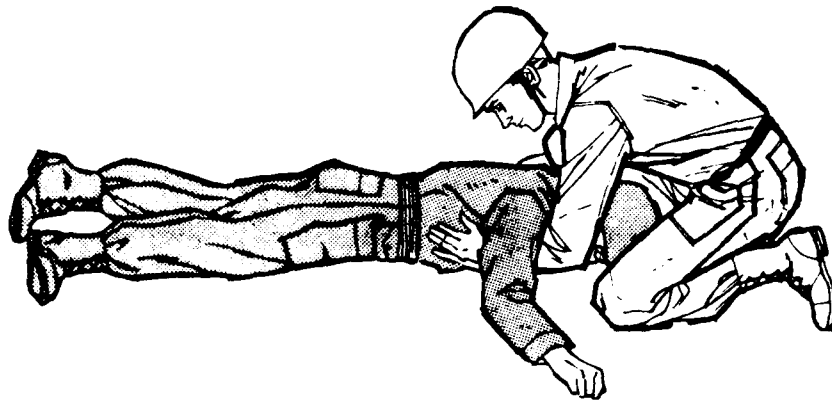


STEP THREE: LIFT THE CASUALTY TO HIS KNEES; THEN SECURE YOUR HOLD AND RAISE HIM TO A STANDING POSITION UNTIL HIS KNEES LOCK.



STEP FOUR: SUPPORTING THE CASUALTY WITH YOUR RIGHT ARM AROUND HIS WAIST, TAKE HOLD OF HIS RIGHT WRIST WITH YOUR LEFT HAND AND MOVE IN FRONT OF HIM.

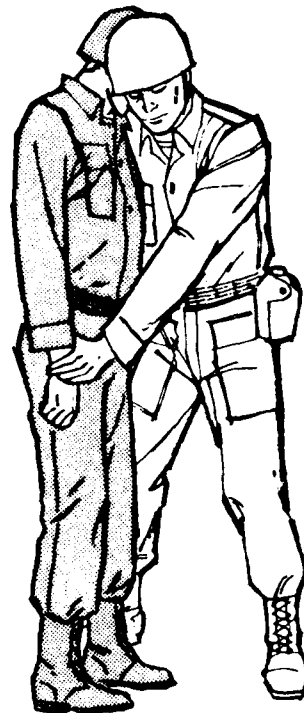
Figure 18-24.—Fireman's carry (steps two, three, and four).



STEP TWO: KNEEL ON ONE KNEE AT THE CASUALTY'S HEAD, FACING HIS FEET; THEN GRASP HIM BY EXTENDING YOUR HANDS UNDER HIS ARMPITS, DOWN HIS SIDES, AND ACROSS HIS BACK.



STEP THREE: AS YOU RISE, LIFT THE CASUALTY TO HIS KNEES; THEN SECURE YOUR HOLD AND RAISE HIM TO A STANDING POSITION UNTIL HIS KNEES LOCK.



STEP FOUR: SUPPORTING THE CASUALTY WITH YOUR RIGHT ARM AROUND HIS WAIST, TAKE HOLD OF HIS RIGHT WRIST WITH YOUR LEFT HAND.

Figure 18-25.—Fireman's carry (steps two, three, and four alternate method).



STEP FIVE: RAISE THE CASUALTY'S RIGHT ARM OVER YOUR HEAD.



STEP SIX: BEND AT THE WAIST AND KNEES; THEN PULL THE CASUALTY'S ARM OVER AND DOWN YOUR LEFT SHOULDER, THUS BRINGING HIS BODY ACROSS YOUR SHOULDERS. AT THE SAME TIME PASS YOUR RIGHT ARM BETWEEN HIS LEGS AND GRASP HIS RIGHT KNEE WITH YOUR HAND.

Figure 18-26.—Fireman's carry (steps five and six).



STEP SEVEN: STAND WITH CASUALTY ON YOUR SHOULDERS.



STEP EIGHT: GRASP THE CASUALTY'S RIGHT WRIST WITH YOUR RIGHT HAND, LEAVING YOUR LEFT HAND FREE. A MAN CAN CARRY ANOTHER PERSON SOME DISTANCE IN THIS MANNER.

Figure 18-27.—Fireman's carry (steps seven and eight).

Supporting Carry

This carry is useful when the casualty is only slightly injured.

1. Lift the casualty off the ground as illustrated in the first three steps of the fireman's carry (figs. 18-23 through 18-25).

2. Grasp the wrist of the casualty's uninjured arm and draw his arm around your neck (fig. 18-28).

3. Let the casualty walk, using you as a crutch.

Arms Carry

This carry is useful for a short distance.

1. Lift the casualty off the ground as illustrated in the first three steps of the fireman's carry (figs. 18-23 and 18-24).



Figure 18-28.—Supporting carry.



Figure 18-29.—Arms carry.

2. Position your arms on the casualty as illustrated in figure 18-29 and lift him into your arms.

3. Carry the casualty high to lessen fatigue.

Saddleback Carry

1. Lift the casualty off the ground as illustrated in the first three steps of the fireman's carry (figs. 18-23 through 18-25).

2. Supporting the casualty with one of your arms around him, turn so the casualty can encircle your neck with his arms; then stoop, clasp your hands beneath his thighs, and raise him upon your back (fig. 18-30).

Pack-Strap Carry

1. Lift the casualty off the ground as illustrated in the first three steps of the fireman's carry (figs. 18-23 through 18-25).



Figure 18-30.—Saddleback carry.

2. Supporting the casualty with your arm around him, grasp his wrist closest to you and place his arm over your head and across your shoulders; then move in front of him while supporting his weight against your back, grasp his other wrist, and place this arm over your shoulder (fig. 18-31, view A).

3. Bend forward and hoist him as high on your back as possible so all his weight is resting on your back (fig. 18-31, view B).

Back Lift and Carry

For use of this carry, the casualty must be conscious and able to stand on at least one leg.

1. Raise the casualty to a standing position and place your back to his back; then have him stretch out his arms sideways.

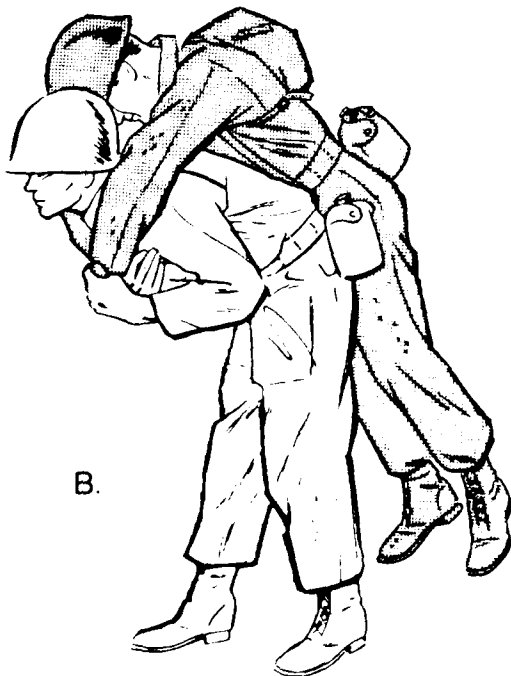
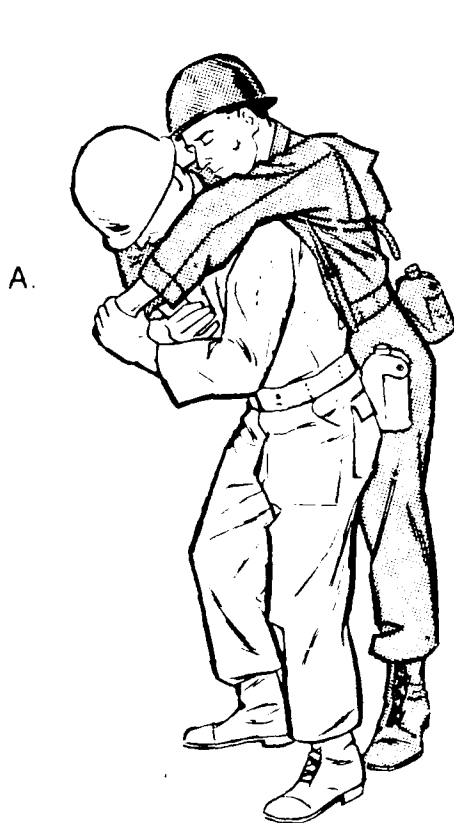


Figure 18-31.—Pack-strap carry.

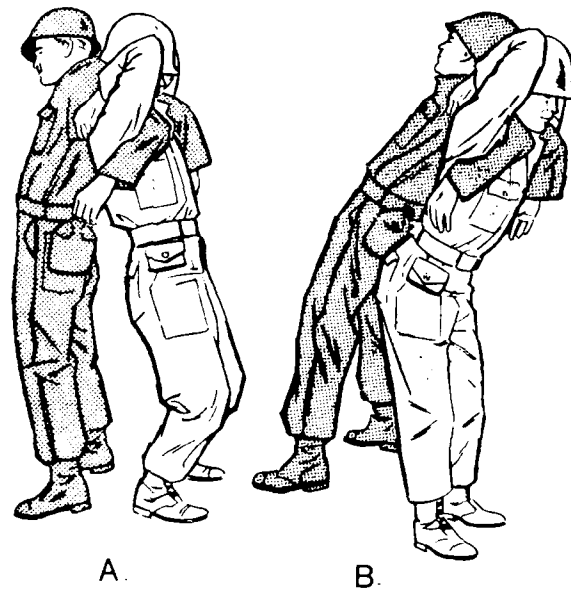


Figure 18-32.—Back lift and carry.

2. Bending backward, put your hands under his arms and grasp his upper arms near the armpits (fig. 18-32, view A).

3. Bend forward, pulling him onto your back (fig. 18-32, view B).

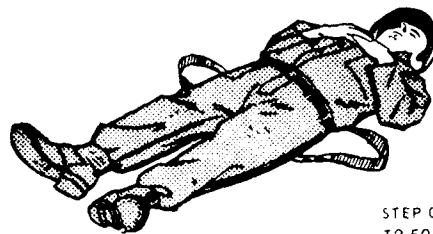
Pistol-Belt Carry

This method can be used for a long distance without undue fatigue on the carrier. If pistol belts are not available, other items can be used, such as one rifle sling, two cravat bandages, two litter straps, or any suitable material that will not cut or bind the casualty. The steps in this method are provided in figures 18-33 through 18-35.

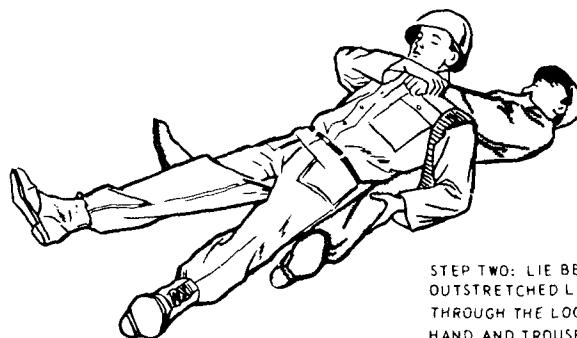
Pistol-Belt Drag

This method (fig. 18-36) enables you and the casualty to remain low on the ground, more protected from enemy fire;

SEABEE COMBAT HANDBOOK



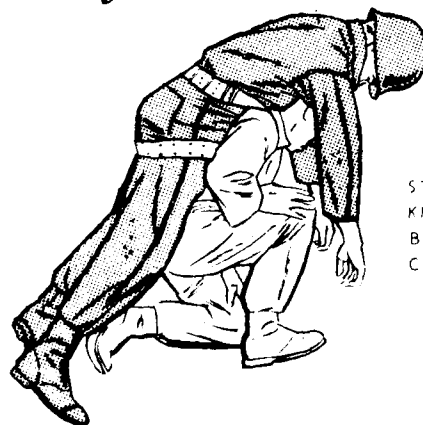
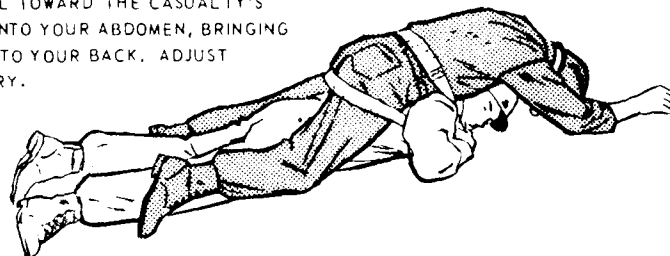
STEP ONE: LINK TOGETHER TWO PISTOL BELTS TO FORM A SLING. PLACE THE SLING UNDER THE CASUALTY'S THIGHS AND LOWER BACK SO THAT A LOOP EXTENDS FROM EACH SIDE.



STEP TWO: LIE BETWEEN THE CASUALTY'S OUTSTRETCHED LEGS. THRUST YOUR ARMS THROUGH THE LOOPS. GRASP CASUALTY'S HAND AND TROUSER LEG ON HIS INJURED SIDE.

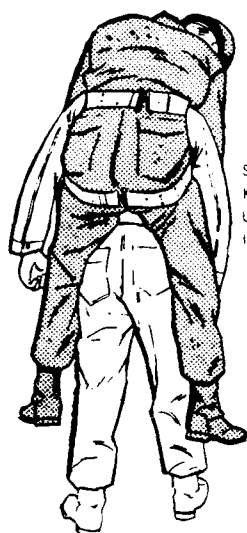
Figure 18-33.—Pistol-belt carry (steps one and two).

STEP THREE: ROLL TOWARD THE CASUALTY'S UNINJURED SIDE ONTO YOUR ABDOMEN, BRINGING THE CASUALTY ONTO YOUR BACK. ADJUST SLING AS NECESSARY.



STEP FOUR: RISE TO A KNEELING POSITION. THE BELT WILL HOLD THE CASUALTY IN PLACE.

Figure 18-34.—Pistol-belt carry (steps three and four).



STEP FIVE: PLACE ONE HAND ON YOUR KNEE FOR SUPPORT AND RISE TO AN UPRIGHT POSITION. THE CASUALTY IS NOW SUPPORTED ON YOUR SHOULDERS.

STEP SIX: CARRY THE CASUALTY WITH YOUR HANDS FREE FOR USE IN FIRING RIFLE, CLIMBING BANKS, OR SURMOUNTING OBSTACLES.



Figure 18-35.—Pistol-belt carry (steps five and six).

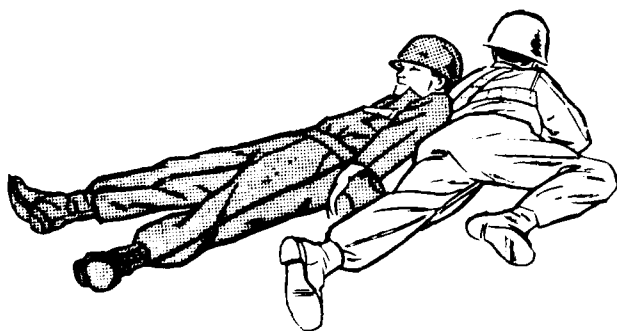


Figure 18-36.—Pistol-belt drag.



Figure 18-37.—Neck drag.

however it is satisfactory for only a short distance.

1. Form a sling by extending two pistol belts or other suitable items to their full length and connecting the ends.

2. With the casualty on his back, pass the sling over his head and position it across his chest and under his armpits.

3. Cross the sling straps at a point near the casualty's shoulder, forming a loop for your shoulder.

4. Lie on your back beside the casualty and slip the loop over your arm which is closer to the casualty; then turn away from the casualty onto your abdomen, thus causing the loop to fit tightly around your shoulder.

5. Place your arm which is nearer the casualty underneath his head to protect it during movement.

6. Crawl along, dragging the casualty with you.

Neck Drag

This method (fig. 18-37) enables you and the casualty to remain close to the ground.

1. Tie the casualty's hands together and loop them around your neck.



Figure 18-38.—Two-man supporting carry.

2. Crawl along, dragging the casualty with you.

Two-Man Supporting Carry

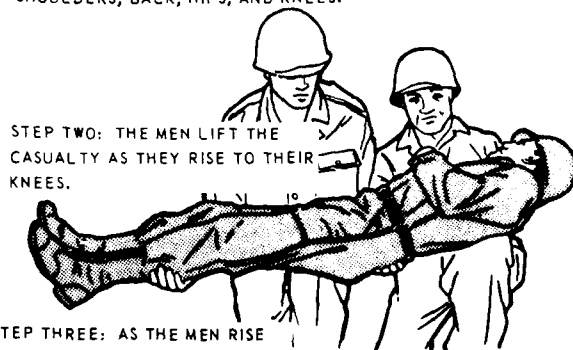
1. Two men help the casualty to his feet and support him with their arms around his waist (fig. 18-38).
2. They grasp the casualty's wrists and draw his arms around their necks.
3. The casualty walks, using the two men as crutches.

Two-Man Arms Carry

Two men lift and carry the casualty as illustrated and explained in figure 18-39.



STEP ONE: TWO MEN KNEEL AT ONE SIDE OF THE CASUALTY AND PLACE THEIR ARMS BENEATH THE CASUALTY'S SHOULDERS, BACK, HIPS, AND KNEES.



STEP TWO: THE MEN LIFT THE CASUALTY AS THEY RISE TO THEIR KNEES.

STEP THREE: AS THE MEN RISE TO THEIR FEET, THEY TURN THE CASUALTY TOWARD THEIR CHESTS. THEY CARRY HIM HIGH TO LESSEN FATIGUE.

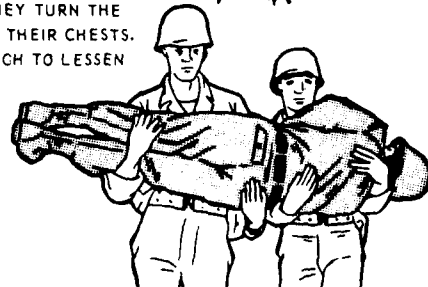


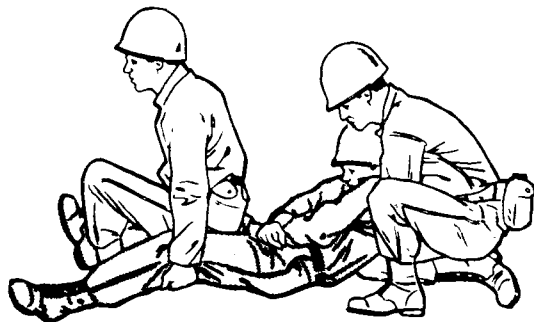
Figure 18-39.—Two-man arms carry (steps one, two, and three).

Two-Man Saddleback Carry

This carry is useful for a short distance. Two men lift and carry the casualty as illustrated and explained in figure 18-40.

Four-Hand (Packsaddle) Carry

Two men make a packsaddle and carry the casualty on it as illustrated and explained in figure 18-41.

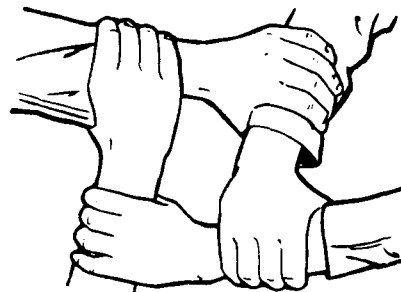


STEP ONE: ONE MAN SPREADS THE CASUALTY'S LEGS, KNEELS BETWEEN THE LEGS WITH HIS BACK TO THE CASUALTY, AND POSITIONS HIS HANDS BEHIND THE KNEES. THE OTHER MAN KNEELS AT THE CASUALTY'S HEAD, SLIDES HIS HANDS UNDER THE ARMS AND ACROSS THE CHEST, AND LOCKS HIS HANDS TOGETHER.



STEP TWO: THE TWO MEN RISE TOGETHER, LIFTING THE CASUALTY.

Figure 18-40.—Two-man saddleback carry (steps one and two).



STEP ONE: EACH MAN GRASPS ONE OF HIS WRISTS AND ONE OF THE OTHER MAN'S WRISTS, THUS FORMING A PACKSADDLE.



STEP TWO: THE TWO MEN LOWER THEMSELVES SUFFICIENTLY FOR THE CASUALTY TO SIT ON THE PACKSADDLE; THEN THEY HAVE THE CASUALTY PLACE HIS ARMS AROUND THEIR SHOULDERS FOR SUPPORT BEFORE THEY RISE TO AN UPRIGHT POSITION.

Figure 18-41.—Four-hand (packsaddle) carry (steps one and two).

HEMORRHAGE



Figure 18-42.—Four-hand arms carry (front and back views).

Four-Hand Arms Carry

1. Two men kneel on opposite sides of the casualty at his hips (fig. 18-42).
2. Each man passes his arms under the casualty's thigh and back and grasps the other man's wrist.
3. The two men rise, lifting the casualty.

Blood is circulated throughout the body by means of three different kinds of blood vessels: arteries, veins, and capillaries. **ARTERIES** are large vessels that carry the blood away from the heart; **VEINS** are large vessels that carry the blood back to the heart, and **CAPILLARIES** form a connecting network of smaller vessels between the arteries and the veins.

Hemorrhage (bleeding) occurs whenever there is a break in the wall of one or more blood vessels. In most small cuts, only the capillaries are injured. Deeper wounds result in injury to veins or arteries. Injury to the capillaries is not serious and can generally be controlled by a small bandage strip or pad. Injury to veins or arteries is serious and may endanger life.

One twelfth to one fifteenth of the body weight is blood. A person weighing 150 pounds will have approximately 10 to 12 pints of blood. One pint of blood can usually be lost without harmful effect; in fact, this is the amount usually given by blood donors. However, the loss of 2 pints will usually cause shock, and shock becomes greater and greater as the amount of blood loss increases. If one half of the blood in the body is lost, death usually results.

Capillary blood is usually brick red in color. If capillaries are cut, the blood oozes out slowly. Blood from the veins is dark red. If a vein is cut, the blood escapes in a steady flow. If an artery near the surface is cut, the blood will gush out in spurts that are synchronized with the heart beats; but if the cut artery is deeply buried, the bleeding will appear in a steady stream. Arterial blood is usually bright red in color.

In actual practice, you might find it difficult to decide whether the bleeding is venous or arterial, but the distinction is usually not important. A person can bleed to death quickly from a cut artery; prolonged bleeding from any large cut can, of course, have the same effect. The important thing to know is that all bleeding must be controlled as quickly as possible.

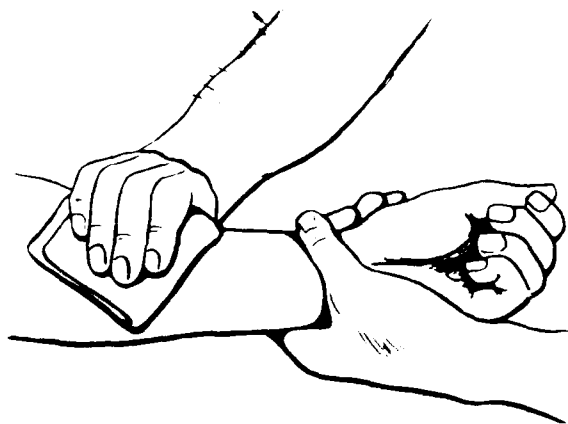
CONTROL OF HEMORRHAGE

When administering first aid to a bleeding victim, you must remain calm. Loss of blood is a dramatic event and always appears severe. In fact, most bleeding is less severe than it may appear to be at first glance. Most of the major arteries are deep and well protected by tissue and bony prominences. Although bleeding can be fatal, you will usually have enough time to think and act calmly before the victim expires. Remember that most errors in first aid are made because of acting without thinking.

The four methods for controlling hemorrhage are direct pressure, elevation, indirect pressure, and the use of a tourniquet.

Direct Pressure

Direct pressure is the first method to use when you are trying to control hemorrhage. In almost every case, bleeding can be stopped by the application of pressure directly on the wound, as illustrated in figure 18-43. Use a sterile first aid dressing, when available, and tie the knot directly over the wound, only tight enough to stop the bleeding. Any clean material can be used in the absence of regular first aid dressings. If the bleeding does not stop, firmly apply another



136.2

Figure 18-43.—Direct pressure.

dressing over the first dressing, or apply direct pressure with your hand or fingers over the dressing. This pressure may be applied by the victim himself or by a buddy. Under no circumstances is a dressing to be removed once it has been applied.

In cases of severe hemorrhage, do not worry too much about the dangers of infection. Although the prevention of infection is important, the basic problem is to stop the flow of blood. If there is no material available, simply thrust your hand onto the wound.

Elevation

Elevating or raising an injured limb above the level of the heart will help to control the bleeding. Elevation should be used together with direct pressure. However, do not elevate a limb if you suspect a fracture until the fracture has been splinted and you can be reasonably certain that elevation will not cause further injury. Use a stable object to maintain elevation, for propping the limb on an unstable object can do more harm than good.

Indirect Pressure

In instances of severe bleeding where direct pressure and elevation are not controlling the bleeding, indirect pressure may be used. Bleeding from a cut artery or vein can often be controlled by applying pressure to the appropriate pressure point. This pressure point is a place where the main artery to the injured part lies near the skin surface and over a bone. Pressure at such a point is applied with the fingers, thumb, or with the heel of the hand; no first aid materials are required. The object of the pressure is to compress the artery against the bone, thus shutting off the flow of blood from the heart to the wound.

CAUTION: Use of pressure points may cause damage to the limb as a result of an inadequate flow of blood. When the use of indirect pressure at a pressure point is necessary, do not substitute indirect pressure for direct pressure; use both.

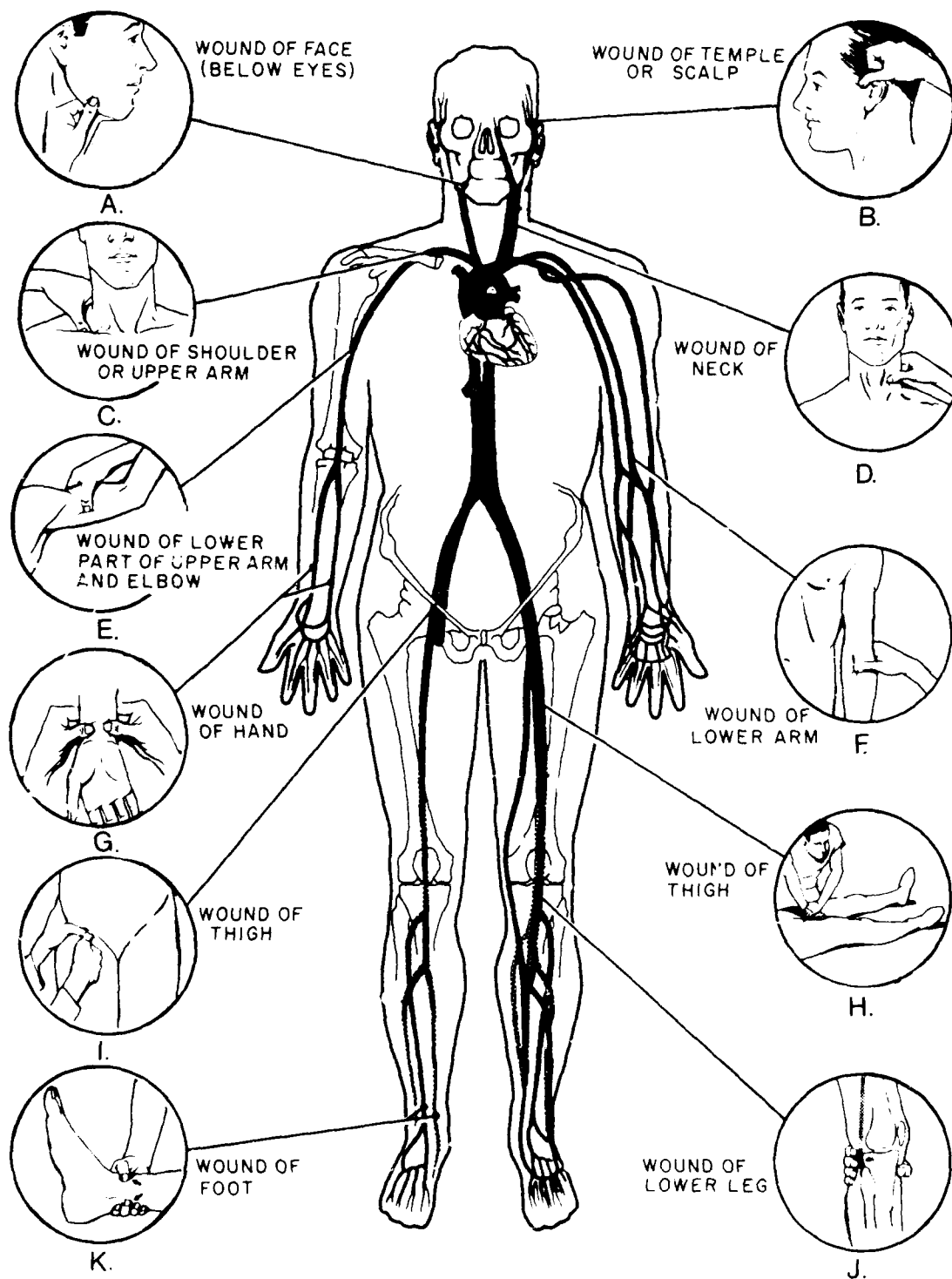


Figure 18-44.—Pressure points for control of bleeding.

Figure 18-44 shows the locations of pressure points and the area of bleeding they control. Pressure points on the arms (brachial pressure points) and in the groin (femoral pressure points) are the ones that are most often used in first aid treatment. These pressure points should be thoroughly understood.

Pressure on the brachial artery is used to control severe bleeding from an open wound on the upper extremity (arm). This pressure point is located in a groove on the inside of the arm and the elbow. Using either the fingers or the thumb, apply pressure to the inner aspect of the arm. Figure 18-44, view E, shows the proper location for the digital pressure.

The femoral artery is used to control severe bleeding from a wound on the lower extremity (leg). The pressure point is located in the front, center part of the crease in the groin area. This is where the artery crosses the pelvic basin on the way into the lower extremity. To apply pressure, position the victim flat on his back, if possible. Kneeling on the opposite side from the wounded limb, place the heel of one hand directly on the pressure point, and lean forward to apply the small amount of pressure needed to close the artery (fig. 18-44, view H). If bleeding is not controlled, it may be necessary to press directly over the artery with the flat surface of the fingertips and to apply additional pressure on the fingertips with the heel of the other hand.

Tourniquet

A tourniquet should be used only as a last resort for severe, life-threatening hemorrhage that cannot be controlled by any other method. First-aiders should thoroughly understand the dangers and limitations of its use. **CAUTION:** A tourniquet may be dangerous. Its application may cause tissue injury or even loss of the injured limb. It is only rarely required and should be used only in cases of partial or complete severance of a limb or when bleeding is uncontrollable.

The standard tourniquet is usually a piece of web belting about 36 inches long, with a buckle or snap device to hold it tightly in place when applied. A tourniquet can be improvised from a strap, belt, neckerchief, or other similar material.

A tourniquet should be at least 2 inches wide to distribute pressure over tissues. Never use wire, cord, or anything that will cut into the flesh.

To apply an emergency tourniquet made from material resembling a cravat or neckerchief, wrap the material once around the limb, and tie an overhand knot. Place a short stick on the overhand knot, and tie a square knot over it. Then twist the stick to tighten the tourniquet. The stick may be tied in place with another strip of material. Figure 18-45 demonstrates the proper method for applying a tourniquet.

Here are some major points that you must know about the use of a tourniquet.

- Don't use a tourniquet unless you cannot control the bleeding by any other means.
- Only use a tourniquet on an arm or a leg.
- Always apply a tourniquet between the wound and the heart, making it as close to the wound as possible. If the wound is just below the elbow or knee, the tourniquet may have to be placed above the joint to get good compression on the limb.
- Make sure you draw the tourniquet tight enough to stop the bleeding but don't make it any tighter than necessary.

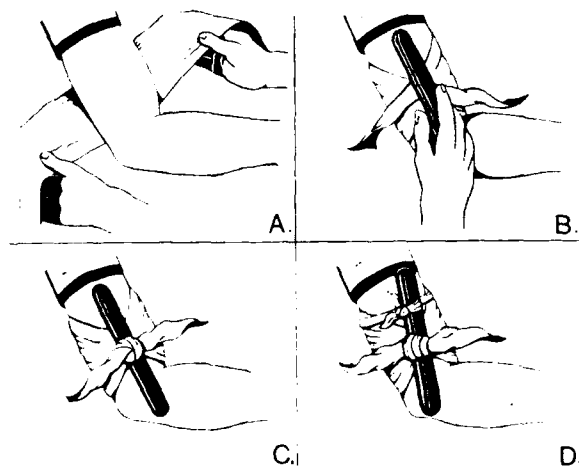


Figure 18-45.—Applying a tourniquet.

- Never loosen a tourniquet once it has been applied. The loosening of a tourniquet may dislodge clots and result in enough blood loss to cause severe shock and death.

- Don't cover a tourniquet with a dressing. If it is necessary to cover the injured person, make sure all the other people concerned with the case know about the tourniquet. Using crayon, skin pencil, or blood, mark a large *T* on the victim's forehead and on a medical tag attached to the victim's wrist. The time the tourniquet was applied must also be indicated.

Armpit Tourniquet

A deep wound high up on the arm or an amputation at the upper part of the arm may require a tourniquet at the armpit to control bleeding. If needed, apply as follows:

1. Place the center of a narrow cravat bandage in the armpit over a firm pad or padded object.
2. Cross the ends on the shoulder over a pad.
3. Carry the ends around the back and chest to the opposite side and tie them over the pad.
4. To tighten, insert a small stick or smaller object under the cross of the bandage on the shoulder and twist. Twist only until the bleeding is controlled. Then secure or anchor the stick to prevent untwisting (fig. 18-45, view D).
5. Again, do not loosen the tourniquet except if directed to do so by a physician.

EMERGENCY SITUATIONS

Bleeding from most external wounds is fairly easy to control. However, when some of the larger arteries are cut, hemorrhage may be so rapid that death will result within a few minutes. The possible methods of controlling the flow of blood in some of these emergency situations are briefly described below.

Wounds of the neck are often caused by sharp objects such as knives, razors, and glass fragments. Sometimes a large artery is cut, sometimes a large vein, and sometimes both. In any event, the blood loss will be extremely rapid. In treating wounds to the neck, an occlusive dressing should be applied over a sterile absorbent

dressing to prevent air from entering the circulation system. It may also be possible to control the bleeding from these wounds by applying hand pressure above and below the cut; such pressure must be maintained until a medical officer gives further instructions. It is a good idea to use cloth under your hands, if any is available, because the blood makes the neck very slippery and difficult to hold.

If the large artery in the leg is cut, the bleeding will be very rapid. At least partial (and perhaps complete) control of the hemorrhage can be attained by immediately applying extreme pressure directly over the wound. Cover your clenched fist with any clothing or other cloth that is available, and thrust your fist directly onto the wound. (If no cloth is available, use your fist alone; but you will find it more difficult to control the bleeding by this method because your fist and the wound will both become very slippery.) If a tourniquet becomes necessary, continue to apply direct pressure with your hand while the tourniquet is being applied.

Internal bleeding may be caused by deep wounds or by heavy blows that rupture internal blood vessels. If you suspect internal bleeding, anticipate that the victim may vomit blood. Give the victim nothing by mouth and keep him lying down, preferably on his side with a loosened collar and belt. Make him as comfortable as possible and reassure him. The victim should always be treated for shock (discussed below).

GENERAL FIRST AID MEASURES

In addition to knowing how to control serious bleeding by the application of pressure, you must be familiar with the following measures that are important in the first aid treatment of a person who has suffered severe bleeding. Any person who has lost a large amount of blood must be treated by medical personnel as soon as possible. In the meantime, you can greatly improve his chances for recovery by treating him for shock as soon as possible and by keeping the person quiet.

Shock is always present in persons who have lost a great amount of blood. If you do not notice symptoms of shock, treat the victim for it anyway. Since the measures used to prevent shock are the same as those used to treat it, you may prevent its occurrence or, at least, lessen its severity.

Equally important, you must keep the casualty quiet. Try to keep him from getting excited. Do not move the victim unnecessarily, and do not handle him roughly. Keeping him quiet will allow a clot to form in the wound and will also help to prevent the occurrence of shock. Try in every way to be careful and gentle in handling the victim, and do everything you can to make him as comfortable as possible under the circumstances.

SHOCK

You will recall in our discussion of hemorrhage above, we said that the loss of 2 or more pints of blood will usually cause shock. You should also know that shock can occur with any injury. And, in fact, some degree of shock usually accompanies serious injuries. You should, therefore, consider shock whenever handling a person who has been injured.

To understand how shock develops, let us look at what happens when you hit the end of your finger with a hammer. Your whole body responds. Since your finger hurts, you might think it is the only part of you that is responding to the injury; but, in fact, a great many changes are taking place in your body while you are concerned with the immediate pain. Your body AS A WHOLE is injured and your body AS A WHOLE attempts to recover from the injury. A series of changes takes place, designed to restore the body to its normal, healthy condition.

Sometimes, however, the changes that occur may in themselves cause further damage to the body. To some extent, this is what happens in shock. When a person is injured, the blood flow in his entire body is disturbed. To overcome this difficulty, the heart beats faster and the blood vessels near the skin and in the arms and legs constrict, thus sending most of the available blood supply to the vital organs of the body and to the nerve centers in the brain that control all vital functions.

While this is occurring, the other cells do not receive enough blood and, therefore, do not get enough oxygen or food. The blood vessels, like the rest of the body, suffer from this lack and eventually lose their ability to constrict. When this happens, the vital organs and the brain do not receive enough blood, and the condition of shock

becomes worse and worse. If this continues, the present damage becomes so extensive that recovery is impossible. In less severe cases, prompt first aid treatment for shock may mean the difference between life and death. In mild cases of shock, recovery usually occurs naturally and rather quickly.

Basically, then, **SHOCK** is a condition in which the circulation of the blood is seriously disturbed. As we will see later, the measures used to combat shock are aimed at helping the body to recover from this disturbance of the blood flow.

CAUSES OF SHOCK

Serious shock occurs as a result of severe injury to any part of the body.

- Crush injuries, fractures, burns, poisoning, and prolonged bleeding are very likely to cause serious shock.

- An interruption of breathing, from whatever cause, is usually followed by severe shock.

- Blast and concussion injuries, caused by pressure waves resulting from the detonation of high explosives in the air or under water, may severely damage the internal organs of the body and cause extensive shock (as a matter of fact, signs of shock are sometimes the only outward indication of a blast or concussion injury).

As noted above, any damage to the body is accompanied by or followed by some degree of shock.

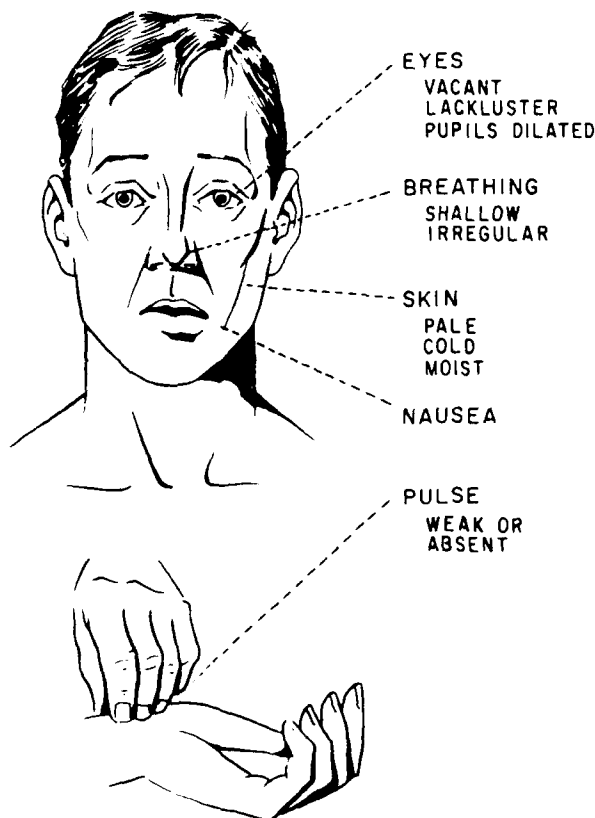
There are a number of factors that affect the seriousness of shock. Age, for example, is often a determining factor. Very young children and very old people do not usually have as much resistance to shock as young or middle-aged adults. Pain can produce shock, or increase its severity. People who have been starved, deprived of water, or exposed to the extremes of cold or heat can go into shock very easily. Excessive fatigue can increase the severity of shock. In general, people who have any chronic illness are more likely to go into shock than healthy individuals. In addition to these factors, there

are some unexplained differences between individuals in regard to their resistance to shock—an injury that might cause mild shock in one person could cause serious, perhaps fatal, shock in another.

There are many different causes and types of shock. It is not within the scope of this text to identify all of them here. You should remember, however, that shock is certain to accompany or follow any serious injury and is often the most serious consequence of the injury.

HOW TO RECOGNIZE SHOCK

A person who is going into shock may show quite a few signs or symptoms. Some of these are indicated in figure 18-46 and are discussed below. Remember, however, that the signs of shock do not always appear at the onset of the injury; in



136.5

Figure 18-46.—Symptoms of shock.

fact, in many very serious cases the signs may not appear until hours later.

The symptoms shown by a person suffering from shock are, directly or indirectly, due to the fact that the circulation of the blood is disturbed.

- The pulse is weak and rapid.
- Breathing is likely to be shallow, rapid, and irregular, because the poor circulation of the blood affects the breathing center in the brain.
- The face, arms, and legs feel cold to the touch. The temperature near the surface of the body is lowered because of the poor blood flow.
- Sweating is likely to be very noticeable.
- A person in shock is usually very pale, but in some cases there may be a bluish or reddish color to the skin.
- The pupils of the eyes are usually dilated (enlarged).

If the victim is conscious, the following additional symptoms of shock may be displayed. He may

- complain of thirst;
- have a feeling of weakness, faintness, or dizziness;
- feel nauseous; or
- be very restless and feel frightened and anxious.

As a shock deepens, these signs gradually disappear and the victim becomes less and less responsive to what is going on around him. Even pain may not arouse him. Finally, the victim may become unconscious.

It is unlikely that you will see all these symptoms of shock in any one case. Some of them appear only in the late stages of shock when the disturbance of the blood flow has become so great that the victim's life is in serious danger. Sometimes the signs of shock may be disguised by other signs of injury. It is important to know

what symptoms indicate the presence of shock, but do not ever wait for symptoms to develop before beginning the treatment for shock. Remember, **EVERY SERIOUSLY INJURED PERSON IS LIKELY TO DEVELOP SERIOUS SHOCK.**

PREVENTION AND TREATMENT OF SHOCK

In many emergency situations, the most helpful thing you can do for an injured person is to begin treatment for shock. If shock has not yet developed, the treatment may actually prevent its occurrence; if it has developed, you may be able to keep it from reaching a critical point. As we have seen, shock creates a vicious cycle—that is, the worse it is, the worse it becomes. It is extremely important that you begin treatment at the earliest opportunity.

It is important to keep the victim as calm as possible because excitement and fright will affect his condition and may even bring on shock. Try to prevent the victim from seeing his injuries, and reassure him that he will be properly cared for. Keep all unnecessary persons away, as their conversation regarding the victim's injuries may increase his agitation.

Fluids

A person in shock is often thirsty. No particular harm will be done if you allow the victim to moisten his mouth and lips with cool water, if it will make him more comfortable. But in general, there is no need to give him anything to drink unless you are in a position where medical assistance will not be available for an excessively long period of time.

If medical care will not be available, you should give the victim **SMALL AMOUNTS** of warm water, preferably mixed with 1 teaspoon of salt and 1/2 teaspoon of baking soda per quart or liter. This should only be done if he is conscious, able to swallow, and has not suffered internal injuries.

In the case of burns, an exception must be made to the rule of not giving liquids. A seriously burned person has an overwhelming need for fluids. It is, therefore, a permissible and even desirable part of first aid treatment for burns to give water or other liquids. Sweet tea, fruit juices, or sugar water may be given, if the casualty is conscious and able to swallow, has no internal injuries, and vomiting is no problem.

One final precaution must be given concerning the use of liquids: **NEVER GIVE ALCOHOL TO A PERSON IN SHOCK OR WHO MAY GO INTO SHOCK.** Alcohol increases the blood supply to surface vessels and so diminishes the blood supply to the brain and other vital organs.

Heat

Heat is important in the treatment of shock to the extent that the injured person's body heat must be conserved. Exposure to cold, with resulting loss of body heat, can cause shock to develop or to become worse. You will have to judge the amount of covering to use by considering the weather and the general circumstances of the accident. Often a light covering will be enough to keep the casualty comfortable. Wet clothing should be removed and dry covering provided, even on a hot day. Use blankets or any dry material to conserve body heat. Artificial means of warming (for example, hot water bottles, heated bricks, or heated sand) should not be ordinarily used. Artificial heat may cause the loss of body fluids (by sweating), and it brings the blood close to the surface, thus defeating the body's own efforts to supply blood to the vital organs and to the brain. Also, the warming agent may burn the victim. **KEEP AN INJURED PERSON WARM ENOUGH FOR COMFORT, BUT DO NOT OVERHEAT HIM.**

Position

The best position to use for the prevention or treatment of shock is one that encourages the flow of blood to the brain. If it is possible to place the injured person on his back on a bed, cot, or stretcher, you can raise the lower end of the support about 12 inches so his feet will be higher

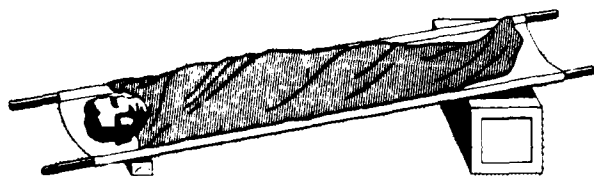
than his head, as illustrated in figure 18-47. If the circumstances of the accident make it impossible to do this, it might still be possible for you to raise his feet and legs enough to help the blood flow to the brain. Sometimes it is possible to take advantage of a natural slope of ground and place the casualty so that his head is lower than his feet.

In every case, of course, you will have to consider what type of injury is present before you can decide on the best position. For example, a person with a chest wound may have so much trouble breathing that you will have to raise his head slightly. If the face is flushed rather than pale, or if you have any reason to suspect head injury, do not raise the feet. Rather, you should keep the head level with or slightly higher than the feet. If the person has broken bones, you will have to judge what position would be best both for the fractures and for shock. A fractured spine must be immobilized before the victim is moved at all, if further injuries are to be avoided. If you have any doubts about the correct position to use, have the victim lie flat on his back. **THE BASIC POSITION FOR TREATING SHOCK IS ONE IN WHICH THE HEAD IS LOWER THAN THE FEET.** Do the best you can, under the particular circumstances, to get the injured person into this position. In any case, never let a seriously injured person sit, stand, or walk around.

MYTHS AND FACTS ABOUT PAIN

The following is a list of common myths and facts concerning pain.

MYTH: All extensive injuries are associated with severe pain and the more extensive the injury, the worse the pain.



136.6

Figure 18-47.—Position for treatment of shock.

FACT: Severe and even fatal injuries may be considerably less painful than a mashed fingertip, which can cause agony.

MYTH: With similar injuries, everyone experiences the same amount of pain.

FACT: Some feel pain far more severely than others. Also, those who would not be in much pain from a wound when they are rested, relaxed, and confident might experience severe pain from the same wound if exhausted, tense, and fearful.

MYTH: Only people in severe pain can go into shock.

FACT: Persons in shock tend to feel less pain. However, pain, unless relieved, may cause or increase shock.

RELIEF OF PAIN

Relief of pain can often be accomplished without the use of drugs. Assure the injured person and make him realize that his injuries are understood and that he will get the best possible care. He should also be told of plans to get medical help or plans to move him to a place where medical assistance is available.

Pain can often be relieved by furnishing adequate support for an injury. Fractures of bones in which the surrounding tissue swells rapidly are extremely painful when left unsupported. Adequate immobilization of fractures not only relieves pain but prevents further tissue damage and shock. Needless suffering can often be eliminated by unlacing or slitting a shoe or loosening tight clothing in the region of the injury. Often a simple adjustment of a bandage or splint will be of much benefit, especially when accompanied by a few encouraging words.

HEAT EXPOSURE INJURIES

Excessive heat affects the body in a variety of ways. When a person exercises in a hot environment, heat builds up inside the body. The body automatically reacts to get rid of this heat through the sweating mechanism. If the body loses large amounts of water and salt from sweating, heat cramps and heat exhaustion are likely to

follow. When the body becomes overheated and cannot eliminate the excessive heat, heatstroke will result.

HEAT CRAMPS

Heat cramps usually affect people who work in hot environments or who engage in strenuous exercise without acclimatization and proper training. Excessive sweating may result in painful heat cramps in the muscles of the abdomen, legs, and arms. Heat cramps may also result from drinking ice water or other cold drinks either too quickly or in too large a quantity after exercise. Muscle cramps are often an early sign of approaching heat exhaustion. Muscle spasms of heat cramps usually last only a few minutes and disappear spontaneously.

TREATMENT. To provide first aid treatment for heat cramps, move the person to a cool place. Since heat cramps are caused by loss of salt and water, give the victim plenty of water to drink, adding about 1 teaspoon of salt to a quart of water. Apply manual pressure to the cramped muscle, or gently massage the muscle to relieve the spasm. In the event that the heat cramps do not pass or become more severe, other symptoms may follow and the victim should be treated as a heat exhaustion casualty and then transferred to a medical facility for further treatment.

HEAT EXHAUSTION

Heat exhaustion is the most common condition resulting from exposure to hot environments. Heat exhaustion can be a combination of several entities and, is therefore, not an easy condition to diagnose. Due to different causes, for example, water depletion or salt depletion or a combination of both, the signs and symptoms may vary.

As a general rule, heat exhaustion will involve a serious disturbance of blood flow to the brain, heart, and lungs, which may cause the victim to experience weakness, fatigue, headache, loss of appetite, and nausea. He may faint but will probably regain consciousness when his head is

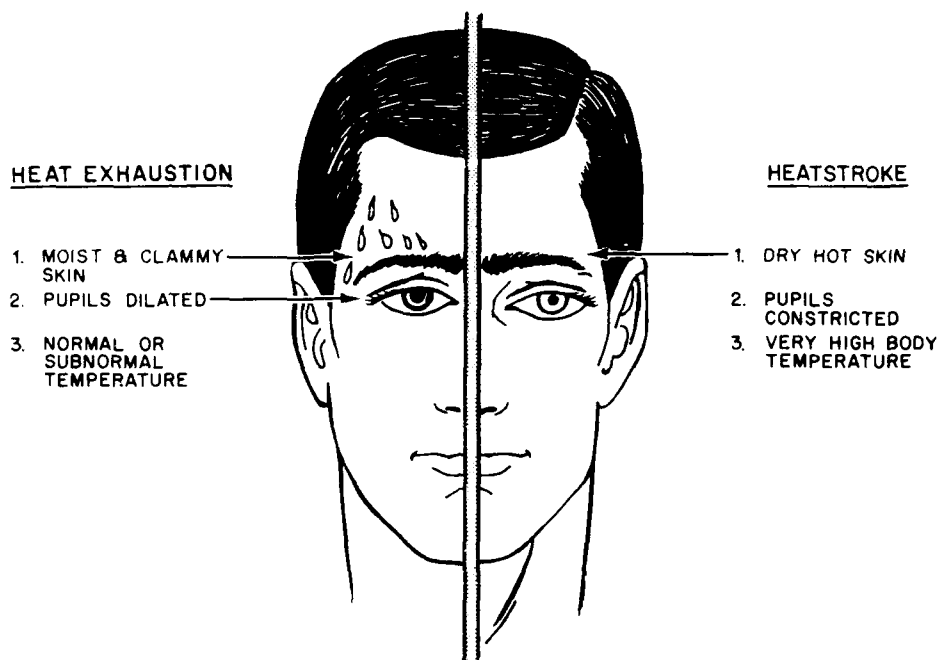
lowered to improve the blood supply to his brain. The victim will appear ashen gray, his skin will be cold, moist, and clammy, and the pupils of his eyes may be dilated (enlarged). The vital signs are usually normal; however, the victim may have a weak pulse, together with rapid and shallow breathing. The body temperature may be below normal. Heat exhaustion is a very complex malady and is often misdiagnosed, even by medical personnel. You, as a first-aider, should treat prolonged heat cramps and any heat injury that is obviously not heatstroke as heat exhaustion.

TREATMENT. Care for the victim as if he were in shock. Move the victim to a cool or air-conditioned area. Loosen the clothing, applying cool wet cloths to the head, axilla, groin, and ankles, and fan the victim. Do not allow the victim to become chilled (if this does occur, then cover the victim with a light blanket and move him into a warmer area). If the victim is conscious, give a solution of 1 teaspoon of salt dissolved in a quart of cool water. If the victim vomits, do not give him any more fluids. Transport the victim to a medical facility as soon as possible.

HEATSTROKE

Sunstroke is more accurately called heatstroke since it is not necessary to be exposed to the sun for this condition to develop. It is a less common but far more serious condition than heat exhaustion since it carries a 20-percent mortality rate. The most important feature of heatstroke is the extremely high body temperature (105°F [41°C] or higher) that accompanies it. In heatstroke, the victim has a breakdown of his sweating mechanism and is unable to eliminate excessive body heat. If the body temperature rises too high, the brain, kidneys, and liver may be permanently damaged.

Sometimes the victim may have preliminary symptoms such as headache, nausea, dizziness, or weakness. Breathing will be deep and rapid at first, later it will be shallow and almost absent. Usually the victim will be flushed, very dry, and very hot. His pupils will be constricted (pinpointed) and the pulse will be fast and strong.



136.67

Figure 18-48.—Symptoms of heatstroke and heat exhaustion.

See figure 18-48 for a comparison of these symptoms with those of heat exhaustion.

TREATMENT. When providing first aid for heatstroke, keep in mind that this is a true life and death emergency. The longer the victim remains overheated, the more likely he is to suffer irreversible body damage or death. The main objective of first aid is to get the body temperature down as quickly as possible.

Move the victim to the coolest possible place, and remove as much clothing as possible. Body heat can be reduced quickly by immersing the victim in a cold water bath. If a cold water bath is not possible, give the victim a sponge bath by applying wet, cold towels to the whole body. Exposing the victim to a fan or air conditioner will also promote body cooling. If cold packs are available, place them under the arms, around the neck, at the ankles, and in the groin. If the victim is conscious, give him cool water to drink. Do not give any hot drinks or stimulants.

Because of the seriousness of heatstroke, it is important to get the victim to a medical facility

as soon as possible. Cooling measures must be continued during transportation.

COLD WEATHER INJURIES

When the body is subjected to severely cold temperatures, the blood vessels constrict and body heat is gradually lost. As the body temperature drops, tissues are easily damaged or destroyed.

All cold injuries are similar, varying only in degree of tissue injury. The extent of injury depends on such factors as wind speed, temperature, type and duration of exposure, and humidity. Tissue freezing is accelerated by wind, humidity, or a combination of the two. Injury caused by cold, dry air will be less than that caused by cold, moist air, or exposure to cold air while you are wearing wet clothing. Fatigue, smoking, drugs, alcoholic beverages, emotional stress, dehydration, and the presence of other injuries intensify the harmful effects of cold.

You should also know that in cold weather, wounds bleed easily because the low temperatures

keep the blood from clotting and increased bleeding, of course, increases the likelihood of shock. Also, wounds open to the cold weather freeze quickly. The body loses heat in the areas around the injury, as blood soaks the skin around the wound, and clothing is usually torn. Therefore, early first aid treatment becomes even more important during periods of low temperatures.

GENERAL COOLING (HYPOTHERMIA)

General cooling of the entire body is caused by continued exposure to low or rapidly dropping temperatures, cold moisture, snow, or ice. Those persons exposed to low temperatures for extended periods may suffer ill effects, even if they are well protected by clothing, because cold affects the body system slowly, almost without notice. As the body temperature drops, there are several stages of progressive discomfort and disability. The first symptom is shivering, which is an attempt by the body to generate heat. This is followed by a feeling of listlessness, drowsiness, and confusion. Unconsciousness may follow quickly. You will have already noted signs of shock. As the temperature drops even lower, the extremities (arms and legs) freeze. Finally, death results.

TREATMENT. Hypothermia is a **MEDICAL EMERGENCY. THE VICTIM NEEDS HEAT.** Rewarm the victim as soon as possible. It may be necessary, however, to treat other injuries before the victim can be moved to a warmer place. Severe bleeding must be controlled and fractures splinted over clothing before the victim is moved.

If the victim is inside a warm place and is conscious, the most effective method of warming him is immersion in a tub of warm water (100° to 105°F [38° to 41°C]) or warm to the elbow—never hot). If a tub is not available, apply external heat to both sides of the victim, using covered hot water bottles or, if necessary, any sort of improvised heating pads. Do not place artificial heat next to bare skin. If immersion is used, only

the body, not the limbs, should be immersed. Immersion of the arms and legs causes cold blood to flow from them to the body core, causing further detrimental cooling of the core. Dry the victim thoroughly if water is used to rewarm him. The most frequently recommended field treatment is “buddy warming.” Since the victim is unable to generate body heat, merely placing him under a blanket or in a sleeping bag is not sufficient. For best results, the nude victim should be placed in a sleeping bag with two volunteers stripped to their shorts to provide body-to-body heat transfer. This technique can be employed by untrained personnel in a tent in the field and **WILL SAVE LIVES!!!**

If the victim is conscious, give him warm liquids to drink. Hot tea with lots of sugar is particularly good. No alcoholic beverages, please.

As soon as possible, transfer the victim to a medical facility, keeping him warm en route. Be alert for signs of respiratory failure and cardiac arrest during transfer.

IMMERSION FOOT (TRENCH FOOT)

Immersion foot, which may also occur in the hands, is a cold injury resulting from prolonged exposure to wet cold temperatures just above freezing. It is often associated with limited motion of the extremities and water-soaked clothing. Remember that the temperature does not need to be below 32°F (0°C) to cause this injury.

In the early stages, the feet and toes are pale and feel cold, numb, and stiff. Walking becomes difficult. If preventive action is not taken, the feet will swell and become painful. In extreme cases, the flesh dies and amputation of the foot or of the leg may be necessary.

TREATMENT. In treating immersion feet (or hands), handle the injured parts very gently. They should not be rubbed or massaged.

Get the victim off his feet as soon as possible. Remove wet shoes, socks, and gloves to improve

circulation. Do not rupture blisters or apply salves or ointments. The feet may be cleansed carefully with soap and water, dried, elevated, and exposed to dry air. Keep the victim warm and transport him to a medical facility as soon as possible. Always evacuate immersion foot victims by litter.

FROSTBITE

Frostbite occurs when ice crystals form in the skin or deeper tissues after exposure to a temperature of 32 °F (0 °C) or lower. Depending upon the temperature, altitude, and wind speed, the exposure time necessary to produce frostbite varies from a few minutes to several hours. The areas most commonly affected are the face and extremities.

The symptoms of frostbite are progressive. Victims generally incur this injury without being acutely aware of it. Initially, the affected skin reddens, and there is an uncomfortable coldness. With continued heat loss, there is a numbness of the affected area because of reduced circulation. As ice crystals form, the frozen extremity appears white, yellow-white, or mottled blue-white, and it is cold, hard, and insensitive to touch or pressure.

Frostbite is classified as superficial or deep, depending on the extent of tissue involvement.

Superficial Frostbite

In superficial frostbite, the surface of the skin will feel hard, but the underlying tissue will be soft, allowing it to move over bony ridges. This is evidence that only the skin and the region just below it are involved.

TREATMENT. A minor case of superficial frostbite is fairly common and serves as a warning. Superficial frostbite can usually be thawed with body heat. Hands can be rewarmed by placing them under the armpit, against the abdomen, or between the thighs. Feet can be rewarmed by using a buddy's armpit or abdomen. Other areas of superficial frostbite can be rewarmed by warm water immersion, skin to skin

contact, or covered hot water bottles. **NEVER RUB** a frostbitten area.

Deep Frostbite

In deep frostbite, the freezing reaches into the deep tissue layers. There are ice crystals in the entire thickness of the extremity. The skin will not move over the bony ridges and feels hard and solid.

TREATMENT. The objectives of treatment are to protect the frozen area from further injury, to rapidly thaw the affected area, and to be prepared to respond to circulatory or respiratory difficulties.

Carefully assess and treat any other injuries first. Constantly monitor the victim's pulse and breathing since respiratory and heart problems can develop rapidly. Be ready to administer CPR.

Make no attempt to thaw the frostbitten area if there is a possibility of refreezing. Freeze-thaw-freeze will result in extension of the injury and may result in amputation.

Treat all victims with injuries to feet or legs as litter cases. When this is not possible, it has been proven that walking will not lessen the chances of successful treatment as long as the limb has not been thawed out.

When adequate protection from further cold exposure is available, prepare the victim for rewarming by removing all constricting items of clothing, such as gloves, boots, and socks. Boots and clothing frozen on the body should be thawed by immersing them in warm water before removal.

Rapidly rewarm frozen areas by immersion in water at 100 °F to 105 °F (38 ° to 41 °C). Keep the water warm by adding fresh hot water, but do not pour it directly on the injured area. Ensure that the frozen area is completely surrounded by water; do not let it rest on the side or bottom of the tub. After rewarming has been completed, pat the area dry with a soft towel. Avoid pressure, rubbing, or constriction of the injured area. Keep the skin dry with sterile dressings, and place cotton between the toes and fingers to avoid their sticking together.

The general morale and comfort of the victim might improve by giving hot, stimulating fluids,

such as tea or coffee. Do not allow the victim to smoke or use alcoholic beverages while he is being treated at the first aid level.

NEVER attempt to thaw frozen parts by rubbing, exercising them, or by heating them in front of an open fire.

Transport the victim to a medical facility as soon as possible. During transportation, slightly elevate the frostbitten area and keep the victim and the injured area warm. DO NOT ALLOW THE INJURED AREA TO BE EXPOSED TO THE COLD.

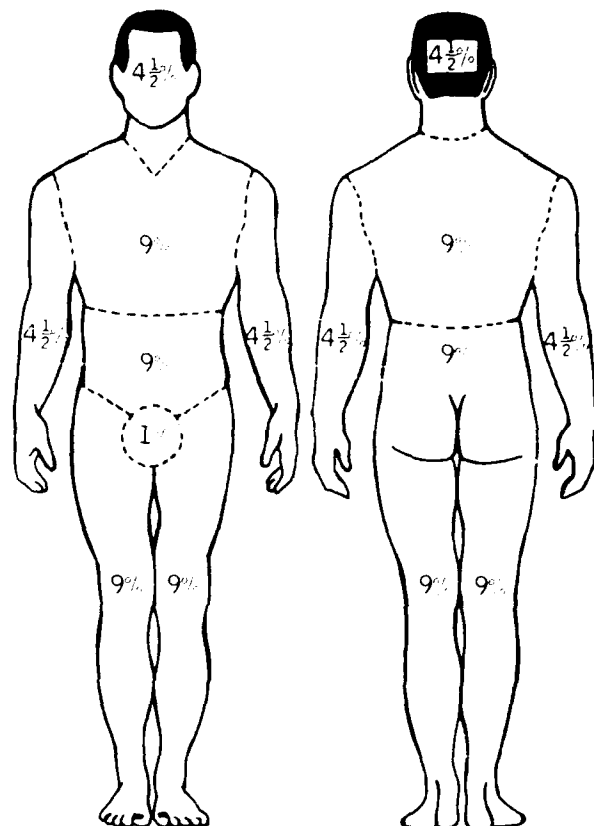
BURNS AND SCALDS

Burns and scalds are caused by exposure to intense heat, such as that generated by fire, bomb flash, sunlight, hot liquids, hot solids, and hot gases. Contact with electric current also causes burns, especially if the skin is dry. Dry skin offers about 20 times more resistance than moist skin to the passage of electric current. Therefore, when the skin is dry, the local heating effects (burns) are greater, even though the total damage to the body is less than when the skin is wet.

Note that burns and scalds are essentially the same type of heat injury. When the injury is caused by dry heat, it is called a burn; when caused by moist heat, it is called a scald. Treatment is the same in both cases.

CLASSIFICATION OF BURNS. Burns are classified in several ways: by the extent of the burned surface, by the depth of the burn, and by the cause of the burn. Of these, the extent of the body surface burned is the most important factor in determining the seriousness of the burn and plays the greatest role in the casualty's chances for survival.

In calculating the extent of burned surface, the **RULE OF NINES** is used, which is illustrated in figure 18-49. These figures aid in determining the correct treatment for the burned person. Shock can be expected in adults with burns over 15 percent or in small children with burns over 10 percent of the body surface area. In adults, burns involving more than 20 percent of the body surface endanger life, and 30-percent burns are



136.31

Figure 18-49.—Rule of nines.

usually fatal if adequate medical treatment is not received.

The depth of injury to the tissues is spoken of in degrees.

1. **FIRST-DEGREE** burns are the mildest, producing redness, increased warmth, tenderness, and mild pain.

2. **SECOND-DEGREE** burns redden and blister the skin and are characterized by severe pain.

3. **THIRD-DEGREE** burns destroy the skin and can destroy the muscle tissue and bone in severe cases.

Severe pain may be absent because nerve endings have been destroyed. The color may vary from white and lifeless (scalds) to black (charred

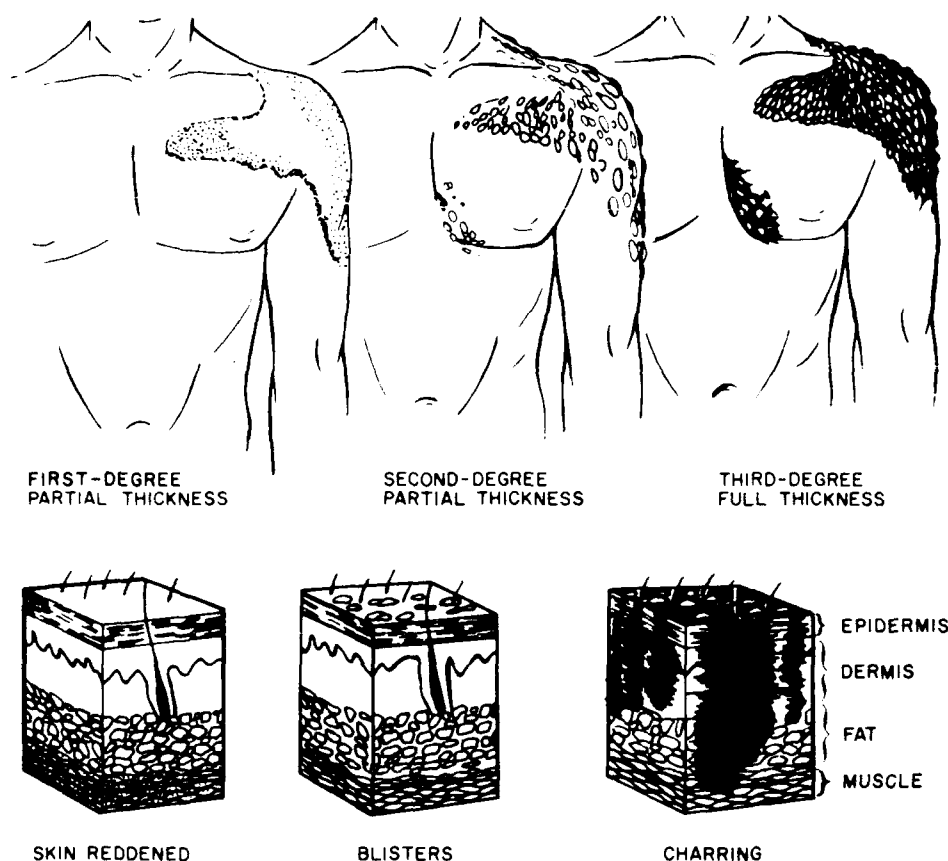


Figure 18-50.—First-, second-, and third-degree burns.

136.32

from gasoline explosions). Figure 18-50 shows the appearance of first-, second-, and third-degree burns.

It is important to remember that the size of the burned area may be far more important than the depth of the burn. A first-degree or second-degree burn that covers a very large area of the body is usually more serious than a small third-degree burn. A first-degree sunburn, for example, can cause death if a very large area of the body is burned.

The causes of burns are generally classified as thermal (heat), chemical, electrical, or radiation. Whatever the cause, shock always results if the burns are extensive.

THERMAL BURNS

Thermal burns are caused by exposure to intensely hot solids, liquids, or gases. Their care depends upon the severity of the burn and the percentage of the body area involved.

TREATMENT. Minor burns, such as first-degree burns over less than 20 percent of the body area and small second-degree burns, do not usually require immediate medical treatment. Burns of the face are the exception to this rule. The following are general rules for treating burn victims.

1. Examine for and relieve any respiratory distress. Always anticipate respiratory difficulty when there are burns around the face or if the victim has been exposed to hot gases or smoke,

since these may cause the airway to swell shut. Keep the airway open by tilting the chin up and forward, or if necessary, by holding the tongue down with a flat object. Place the victim who has facial burns in a sitting position, as this will further ease his breathing. Transport victims of facial burns to a medical facility as soon as possible for further evaluation.

2. Remove all rings, bracelets, and similar articles, even from unburned areas, since swelling may develop rapidly and be severe.

3. To relieve pain initially, apply cold compresses to the affected area or submerge it in cold water. Cold water not only minimizes pain, but also reduces the burning effects in the deep layers of the skin. Gently pat dry the area with a lint-free cloth or gauze. Aspirin is also effective for the relief of pain.

4. Cover the burned area with a sterile dressing, clean sheet, or unused plastic bag. When the hands and feet are involved, dressings must be applied between the fingers and toes to prevent the skin surfaces from sticking to each other. Coverings such as blankets or other materials with a rough texture should not be used because lint may contaminate and further irritate the injured tissue.

5. Do not attempt to break blisters, and do not remove shreds of tissue or adhered particles of charred clothing. Never apply greasy substances (butter, lard, or petroleum jelly), antiseptic preparations, or ointments. These may cause further complications and interfere with later treatment by a physician.

6. If the victim is conscious and not vomiting, prepare a weak solution of salt (1 teaspoon) and baking soda (1/2 teaspoon) in a quart of warm water. Allow the victim to sip the drink slowly.

7. Treat for shock. Maintain the victim's body heat, but do not allow him to become overheated.

8. If the victim's hands, feet, or legs are affected, they should be elevated higher than the heart.

9. If the burn victim is to be transported to a medical facility, try to contact the facility before he arrives to allow the facility time to prepare for immediate treatment. Inform them of the degree of the burn, the location, and the percentage of the body area involved.

CHEMICAL BURNS

When acids, alkalies, or other chemicals come in contact with the skin or other body membranes, they can cause injuries that are generally referred to as chemical burns. For the most part, these injuries are not caused by heat, but by direct chemical destruction of body tissues. The areas most often affected are the extremities, mouth, and eyes. Alkali burns are usually more serious than acid burns for alkalies penetrate deeper and burn longer.

TREATMENT. When such burns occur on board ship, or in the shop, emergency measures must be carried out immediately, without waiting for the arrival of medical personnel. The following procedures should be followed when you are treating chemical burns.

1. Begin flushing the area immediately with large amounts of water, using a shower or hose, if available. Do not apply water too forcefully. Continue to flood the area while the clothing, including the shoes and socks, is being removed, as well as afterwards. **NOTE:** There are two exceptions to the above. In alkali burns caused by dry lime, the mixing of water and lime creates a very corrosive substance. Dry lime should be brushed from the skin and clothing, unless large amounts of water are available for rapid and complete flushing. In acid burns caused by phenol (carbolic acid), wash the affected area with alcohol because phenol is not water soluble. Then wash with water. If alcohol is not available, flushing with water is better than no treatment at all.

2. After thorough washing, neutralize any chemical that remains on the affected area. **WARNING:** Do not attempt to neutralize any chemical unless you are exactly sure what it is and what substance will effectively neutralize it. Further damage may be done by a neutralizing agent that is too strong or incorrect. For acid burns, mix a solution of 1 teaspoon of baking soda in a pint of water and flush it over the affected area.

3. Flush the area again with water and gently pat it dry with sterile gauze. Do not rub the area.

4. Transport the victim to a medical facility.

CHEMICAL BURNS OF THE EYE. Flush the eye immediately with large amounts of fresh, clean water. Acid burns should be flushed at least 5 minutes, and alkali burns flushed for as long as 20 minutes. Because of the intense pain, the victim may be unable to open his eyes. If this occurs, hold the eyelids apart so water can flow across the eye.

A drinking fountain may be used to supply a steady stream of water. Hold the victim's head in a position that allows water to flow from the inside corner of the eye toward the outside. Do not allow the water to fall directly on the eye, nor use greater force than is necessary to keep the water flowing across the eye.

CAUTION: Never use any chemical antidotes, such as vinegar, baking soda, or alcohol, in treating burns of the eye.

After thorough irrigation, loosely cover both eyes with a clean dressing.

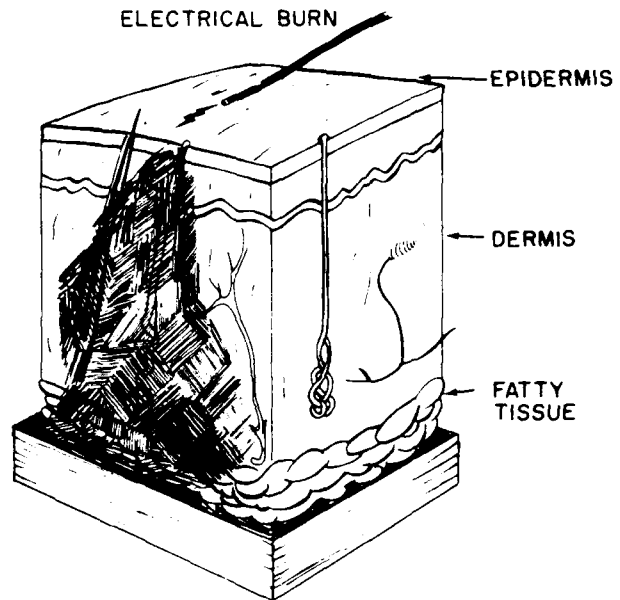
The aftercare for all chemical burns is similar to that for thermal burns; cover the affected area and get the victim to a medical facility as soon as possible.

ELECTRICAL BURNS

Electrical burns are more serious than they first appear. The entrance wound may be small, but as electricity penetrates the skin, it burns a large area below the surface, as illustrated in figure 18-51. Usually there are two external burn areas: one where the current enters the body, and another where it leaves.

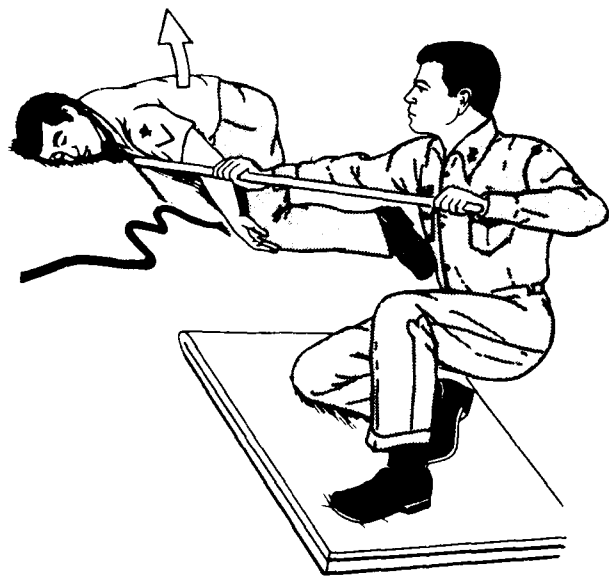
Before administering first aid, remove the victim from the electrical source. If power equipment is involved, shut it off or disconnect it immediately. If the victim is in an automobile accident and a live wire is lying on the car, pull the wire from the car, using a nonconducting dry rope or similar object. Stay away from the severed end of the power line because it can jump.

When rescuing a victim who has come into direct contact with a power line, stand on a well-insulated object, and use a dry rope or a wooden pole to either push or pull the wire away from the victim, or the victim away from the wire. See figure 18-52. Do not touch the victim until this is done or you too will become a casualty.



136.65

Figure 18-51.—Electrical penetration of the skin.



136.66

Figure 18-52.—Pushing a victim away from a power line.

Electrical burns are often accompanied by respiratory failure and cardiac arrest, which are of more immediate danger to the victim than the burn itself. Start CPR immediately and continue until the victim regains a normal heartbeat and breathing pattern. Finally, lightly cover the site of the burn with a dry, preferably sterile dressing, treat for shock, and transport the victim to a medical facility.

WHITE PHOSPHOROUS BURNS

A special category of burns, which may affect military personnel in either a wartime or training situation, is that caused by exposure to white phosphorous (WP or "Willie Peter"). First aid for this type of burn is complicated by the fact that white phosphorous particles ignite upon contact with air.

TREATMENT. Superficial burns caused by simple skin contact or burning clothes can be flushed with water and treated like thermal burns. Partially embedded white phosphorous particles must be continuously flushed with water while the first-aider removes them with whatever tools are available, such as tweezers, and needle-nose pliers. Do this quickly but gently. Firmly or deeply embedded particles that cannot be removed by the first-aider must be covered with a saline-soaked dressing, which must be kept wet until the victim reaches medical personnel. When rescuing victims from a closed space where white phosphorous is burning, protect your lungs with a wet cloth over your nose and mouth.

FRACTURES

Many kinds of accidents cause injuries to the bones, joints, and muscles. In giving first aid to an injured person, you must always look for signs of fractures (broken bones), dislocations, sprains, strains, and contusions (bruises).

An essential part of the first aid treatment for fractures consists of immobilizing the injured part with splints so the sharp ends of broken bones will not move around and cause further damage to the nerves, blood vessels, or vital organs. Splints are also used to immobilize severely injured joints or muscles and to prevent the enlargement of extensive wounds. You must have

a general understanding of the use of splints before going on to learn detailed first aid treatment for injuries to the bones, joints, and muscles.

USE OF SPLINTS

In an emergency almost any firm object or material will serve as a splint. Thus umbrellas, canes, swords, rifles, tent pegs, laths, sticks, oars, paddles, spars, wire, leather, boards, pillows, heavy clothing, corrugated cardboard, and folded newspaper may be used as splints. A fractured leg may sometimes be splinted by fastening it securely to the uninjured leg.

Splints, whether ready-made or improvised, must fulfill certain requirements. They should be lightweight, strong, fairly rigid, and long enough to reach the joints above and below the fracture. Splints should be wide enough so the bandages used to hold them in place will not pinch the injured part. Splints must be well padded on the sides touching the body. If they are not properly padded, they will not fit well and will not adequately immobilize the injured part. If you have to improvise the padding for a splint, you may use articles of clothing, bandages, cotton, blankets, or any other soft material. If the victim is wearing heavy clothes, you may be able to apply the splint on the outside, thus allowing the clothing to serve as at least part of the required padding.

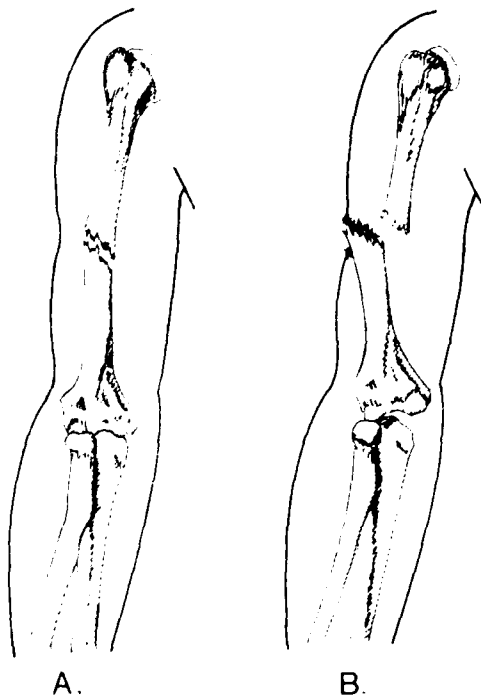
To apply splints to an injured part, fasten them in place with bandages, strips of adhesive tape, articles of clothing, or any other available material. If possible, one person should hold the splints in position while another person fastens them.

Although splints should be applied snugly, they should NEVER be so tight as to interfere with the circulation of blood. When you are applying splints to an arm or leg, try to leave the fingers or toes exposed. If the tips of the fingers or toes become blue or cold, you will know that the splints or bandages are too tight. You should examine a splinted part approximately every half hour, and loosen the fastening if the circulation appears to be impaired. Remember that any injured part is likely to swell, and splints or bandages that are applied correctly may later become too tight.

INJURIES TO BONES

A break in a bone is called a **FRACTURE**. There are two main kinds of fractures. A **CLOSED FRACTURE** is one in which the injury is entirely internal, that is, the bone is broken but there is no break in the skin. A **OPEN FRACTURE** is one in which there is an open wound in the tissues and skin. This type of break and wound is also referred to as a compound fracture. Sometimes the open wound is made when a sharp end of the broken bone pushes out through the flesh; sometimes it is made by an object, such as a bullet, that penetrates from the outside. Figure 18-53 shows closed and open fractures.

Open fractures are far more serious than closed fractures. They usually involve extensive tissue damage and are likely to become infected. Closed fractures are sometimes converted into open fractures by rough or careless handling of the victim. Therefore, **ALWAYS USE EXTREME CARE AND CAUTION WHEN TREATING A SUSPECTED FRACTURE.**



A.

B.

136.20

Figure 18-53.—Types of fractures.

It is not always easy to recognize a fracture. All fractures, whether closed or open, are likely to cause severe pain or shock, but other symptoms may vary considerably. A broken bone sometimes causes the injured part to become deformed, or to assume an unnatural position. However, this is not always the case. Pain and swelling may be localized at the fracture site, and there may be a wobbly movement if the bone is broken clear through. It may be difficult or impossible for the victim to move the injured part. If movement is possible, the victim may feel a grating sensation as the ends of the broken bone rub against each other. However, if a bone is cracked rather than broken through, the victim may be able to move the injured part without much difficulty. An open fracture is easy to recognize if an end of the broken bone protrudes through the flesh. If the bone does not protrude, you might see the external wound but fail to recognize the broken bone.

If you are required to give first aid to a person who has suffered a fracture, follow these general rules.

1. If there is any possibility that a fracture has been sustained, treat the injury as a fracture.
2. Get the victim to a medical facility at the first opportunity. All fractures require medical treatment.
3. Do not move the victim until the injured part has been splinted, unless you must move out of a life-threatening environment to prevent further injury.
4. Treat for shock.
5. Do not attempt to locate a fracture by grating the ends of the bone together.
6. Do not attempt to set a broken bone.
7. When a long bone in the arm or leg is fractured, the limb should be carefully straightened so splints can be applied. Never attempt to straighten the limb by applying force or traction. Pulling gently with your hands in the direction of the long axis of the limb is permissible and may be all that is necessary to get the limb back into position.
8. Apply splints. If the victim must be transported for some distance, or if a considerable period of time will elapse before treatment by a medical officer, it may be better to remove enough of the victim's clothing so you can apply well-padded splints directly to the injured part.

However, if the victim is to be transported only a short distance, or if treatment by a medical officer will not be delayed, it is probably best to leave the clothing on and apply emergency splinting over it. If you decide to remove the clothing over the injured part, extreme care must be taken. Cut away the clothing or rip it along the seams. Remember, rough handling of the victim may convert a closed fracture into an open fracture, increase the severity of shock, and cause extensive damage to the blood vessels, nerves, muscles, and other tissues around the broken bone.

9. If the fracture is open, you must take care of the wound before you can treat the fracture. Bleeding from the wound may be quite serious; however, most bleeding can be stopped by applying direct pressure on the wound or by applying digital pressure at the appropriate pressure point. If these methods are not successful, use a tourniquet. Then treat the fracture.

Now that we have examined the general rules for treating fractures, let us discuss the symptoms and emergency treatment for fractures for the forearm, upper arm, thigh, lower leg, kneecap, collarbone, rib, nose, jaw, skull, spine, and pelvis.

FRACTURE OF THE FOREARM

There are two large bones in the forearm. When both are broken, the arm usually appears to be deformed. When only one bone is broken, the other acts as a splint and the arm, therefore, retains a more or less natural appearance. Any fracture of the forearm is likely to result in pain, tenderness, an inability to use the forearm, and a wobbly motion at the point of injury. If the fracture is open, there will be an open wound through which the bone may show.

TREATMENT. If the fracture is open, stop the bleeding and treat the wound. Apply a sterile dressing over the wound.

Carefully straighten the forearm. (Remember that rough handling of a closed fracture may convert it into an open fracture.)

Apply two well-padded splints to the forearm, one on the top (backhand side) and one on the bottom (palm side). Make sure the splints are long enough to extend from the elbow to the wrist. Use bandages to hold the splints in place.



136.21

Figure 18-54.—Sling used to support a fractured forearm.

Put the forearm across the chest. The palm of the hand should be turned in, with the thumb pointing upward. Support the forearm in this position by means of a wide sling, as shown in figure 18-54. The hand should be raised about 4 inches above the heel of the elbow.

As in all cases of fracture, treat the victim for shock and obtain medical attention as soon as possible.

FRACTURE OF THE UPPER ARM

The signs of fracture in the upper arm include pain, tenderness, swelling, and a wobbly motion at the point of fracture. If the fracture is near the elbow, the arm is likely to be straight, with no bend at the elbow.

TREATMENT. If the fracture is open, stop the bleeding and treat the wound before attempting to treat the fracture. Treatment of the fracture depends partly upon the location of the break—that is, whether the fracture is in the upper part of the arm, in the middle of the upper arm, or near the elbow.

If the fracture is in the upper part of the arm, near the shoulder, place a pad or folded towel in the armpit, bandage the arm securely to the body, and support the forearm in a narrow sling.

If the fracture is in the middle of the upper arm, you may use one well-padded splint on the outside of the arm. The splint should extend from the shoulder to the elbow. Fasten the splinted arm firmly to the body, and support the forearm in a narrow sling, as depicted in figure 18-55.

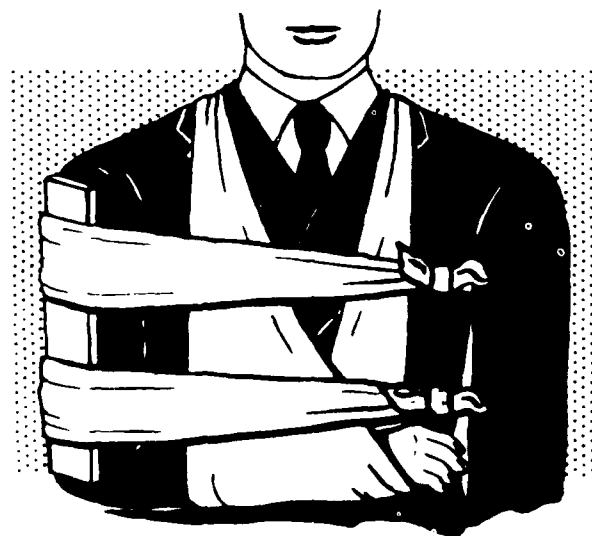
Another method of treating a fracture in the middle of the upper arm is to fasten two wide splints, or four narrow ones, around the arm, and support the forearm in a narrow sling. If you use a splint between the arm and the body, ensure it does not extend too far up into the armpit. A splint in this position can cause a dangerous compression of the blood vessels and nerves and may be extremely painful to the victim.

If the fracture is at or near the elbow, the arm may be either bent or straight. No matter what position you find the arm in, **DO NOT ATTEMPT TO STRAIGHTEN IT OR MOVE IT IN ANY WAY**. As carefully as possible, splint the arm in the position in which you find it.

Treat the victim for shock, and obtain medical care as soon as possible.

FRACTURE OF THE THIGH

The thighbone is the long bone in the upper part of the leg, between the kneecap and the



136.22

Figure 18-55.—Splint and sling for a fractured upper arm.

pelvis. When the thighbone is fractured, any attempt to move the limb results in a spasm of the muscles and causes excruciating pain. The leg has a wobbly motion, and there is complete loss of control below the fracture. The limb usually assumes an unnatural position, with the toes pointing outward. The fractured leg is shorter than the uninjured one, by actual measurement, because of the pull of the powerful thigh muscles. Serious damage to the blood vessels and nerves often results from a fracture of the thighbone. Shock is likely to be severe.

TREATMENT. If the fracture is open, stop the bleeding and treat the wound before attempting to treat the fracture itself. Serious bleeding is a special danger in this type of injury, since the broken bone may tear or cut the large artery in the thigh.

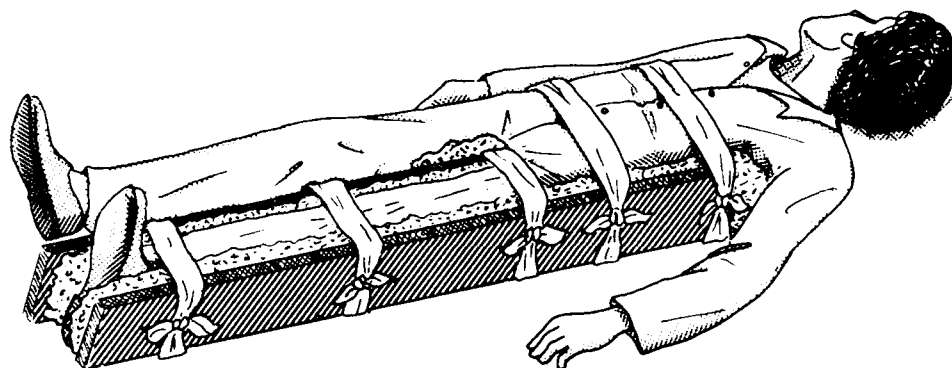
Carefully straighten the leg. Apply two splints, one on the outside of the injured leg and one on the inside. The outside splint should reach from the armpit to the foot. Make sure the inside splint reaches from the crotch to the foot. The splints should be fastened in five places: (1) around the ankle, (2) over the knee, (3) just below the hip, (4) around the pelvis, and (5) just below the armpit. Both legs should be tied together to support the injured leg as firmly as possible.

It is essential that a fractured thigh be splinted before the victim is moved. Ready-made splints are best, but improvised splints may be used. Figure 18-56 illustrates how boards may be used as an emergency splint for a fractured thigh. Remember, **DO NOT MOVE THE VICTIM UNTIL THE INJURED LEG HAS BEEN IMMOBILIZED**.

Treat the victim for shock, and get medical care at the earliest opportunity.

FRACTURE OF THE LOWER LEG

When both bones of the lower leg are broken, the usual signs of fracture are likely to be present. When only one bone is broken, the other one acts as a splint and thus to some extent prevents deformity of the leg. However, tenderness, swelling, and pain at the point of fracture are usually present. A fracture just above the ankle is often mistaken for a sprain. If both bones of the lower leg are broken, an open fracture is likely to result.



136.23

Figure 18-56.—Boards used as emergency splints for fractured thigh.

TREATMENT. If the fracture is open, stop the bleeding and treat the wound.

Carefully straighten the injured leg. Apply three splints—one on each side of the leg and one underneath. Ensure the splints are well padded, especially under the knee and at the bones on each side of the ankle.

A pillow and two side splints work well for treatment of a fractured lower leg. Place the pillow beside the injured leg; then carefully lift the leg, and place it in the middle of the pillow. Bring the edges of the pillow around to the front of the leg, and pin them together. Then place one splint on each side of the leg, over the pillow, and fasten them in place with strips of bandage or adhesive tape.

Treat the victim for shock, and obtain medical care as soon as possible.

FRACTURE OF THE KNEECAP

TREATMENT. The first aid treatment for a fractured kneecap is as follows:

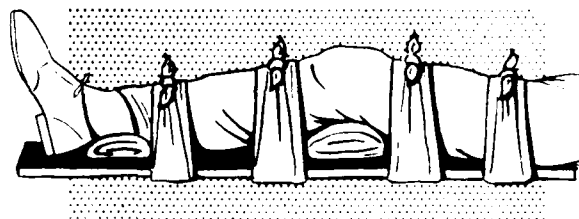
Carefully straighten the injured limb. Immobilize the fracture by placing a padded board under the injured limb. The board should be at least 4 inches wide and should reach from the buttock to the heel. Place extra padding under the knee and just above the heel, as shown in figure 18-57. Use strips of bandage to fasten the leg to the board in four places: (1) just below the knee, (2) just above the knee, (3) at the ankle, and

(4) at the thigh. **DO NOT COVER THE KNEE ITSELF.** Swelling is likely to occur rapidly, and any bandage or tie fastened over the knee would quickly become too tight.

Treat the victim for shock and get medical aid as soon as possible.

FRACTURE OF THE COLLARBONE

A person with a fractured collarbone usually shows definitive symptoms. When the victim stands, the injured shoulder is lower than the uninjured one. Usually the victim is unable to raise his arm above the level of his shoulder. The injured person may attempt to support the injured shoulder by holding the elbow of that side in his other hand—that is, in fact, a characteristic position assumed by a person with a broken collarbone. Since the collarbone lies near the surface of the skin, you may be able to detect the



136.24

Figure 18-57.—Immobilization of fractured kneecap.

point of fracture by the deformity and localized pain and tenderness.

TREATMENT. If the fracture is open, stop the flow of blood and treat the wound before attempting to treat the fracture. You must bend the victim's arm on his injured side, and place his forearm across the chest. The palm of his hand should be turned in, with the thumb pointing up. The hand should be raised about 4 inches above the level of the elbow. Support the forearm in this position by means of a wide sling.

Next, use a wide roller bandage (or any wide strip of cloth) to fasten the victim's arm to his body. Wrap the bandage several times around the victim's body, and ensure it goes down over the hand so that the arm will be held close against the body.

Treat the victim for shock, and obtain medical attention at the earliest opportunity.

FRACTURE OF THE RIB

If the ribs are broken, the victim should be kept comfortable and quiet so the greatest danger, the possibility of further damage to the lungs, heart, or chest wall by the broken ends, is minimized.

The common finding in all victims with fractured ribs is pain localized at the fracture site. By asking the patient to point out the exact area of pain, you can often determine the location of the injury. There may or may not be a rib deformity, or chest wall contusion, or laceration of the area. Deep breathing, coughing, or movement is usually painful. The patient generally wishes to remain still and may often lean toward the injured side, with one hand over the fractured area to immobilize the chest and to ease the pain.

TREATMENT. In general, rib fractures are not bound, strapped, or taped if the victim is reasonably comfortable. However, they may be splinted by the use of external support. If the patient is considerably more comfortable with the chest immobilized, the best method is to use a swathe bandage (figure 18-58), in which the arm on the injured side is strapped to the chest with the palm flat, the thumb up, and with the forearm raised to a 45° angle. Immobilize the chest, using wide strips of bandage to secure the arm to the chest. Wide strips of adhesive plaster applied directly to the skin of the chest for immobilization



136.25A

Figure 18-58.—Swathe bandaging of fractured rib victim.

should not be used, since the adhesive tends to limit the ability of the chest to expand and thus interferes with proper breathing.

Treat the victim for shock and obtain medical attention as soon as possible.

FRACTURE OF THE NOSE

A fracture of the nose usually causes localized pain and swelling, a noticeable deformity of the nose, and extensive nosebleed.

TREATMENT. First, stop the nosebleed. Have the victim sit quietly, with the head tipped slightly backward. Instruct the patient to breathe through his mouth, not his nose. If the bleeding does not stop within a few minutes, apply a cold compress or ice bag over the nose.

Treat the victim for shock, and obtain medical help as soon as possible. A permanent deformity of the nose may result if the fracture is not treated promptly.

FRACTURE OF THE JAW

A person who has a fractured jaw may suffer a serious interference with breathing. The victim

is likely to have great difficulty in talking, chewing, or swallowing. Any movement of the jaw causes pain. The teeth may be out of line, and there may be bleeding from the gums. Considerable swelling may develop.

TREATMENT. One of the most important phases of emergency care is to clear the upper respiratory passage of any obstruction. If the fractured jaw interferes with breathing, pull the lower jaw and tongue FORWARD and keep them in that position.

Apply a four-tailed bandage, as shown in figure 18-59. Be sure the bandage pulls the lower jaw FORWARD. Never apply any bandage that forces the jaw backward, since this might seriously interfere with breathing. The bandage must be firm to support the jaw properly, but it must not press against the victim's throat. Ensure the victim has scissors or a knife to cut the bandage in case of vomiting.

Treat the victim for shock and obtain medical attention as soon as possible.

FRACTURE OF THE SKULL

When a person suffers a head injury, the greatest danger is that the brain may be severely damaged. Whether or not the skull is fractured is a matter of secondary importance. In some cases, injuries that fracture the skull do not cause serious brain damage. But brain damage can, and frequently does, result from apparently slight

injuries that do not cause damage to the skull itself.

It is often difficult to determine whether an injury has affected the brain, because symptoms of brain damage vary greatly. Any person who has suffered a head injury of any kind must be handled carefully and given immediate medical attention.

Some of the symptoms that may indicate brain damage are listed below. However, you must remember that these symptoms are not always present in any one case, and that the symptoms that do occur may be greatly delayed.

1. Bruises or wounds of the scalp may indicate that the victim has sustained a blow to the head. Sometimes the skull is actually depressed at the point of impact. If the fracture is open, you may find bullets, glass, shrapnel, or other objects penetrating the skull.

2. The victim may be conscious or unconscious. If conscious, the victim may feel dizzy and weak, as though he were going to faint.

3. Severe headache sometimes (but not always) accompanies head injuries.

4. The pupils of the eyes may be unequal in size and may not react normally to light.

5. There may be bleeding from the ears, nose, or mouth.

6. The victim may vomit.

7. The victim may be restless and perhaps confused and disoriented.

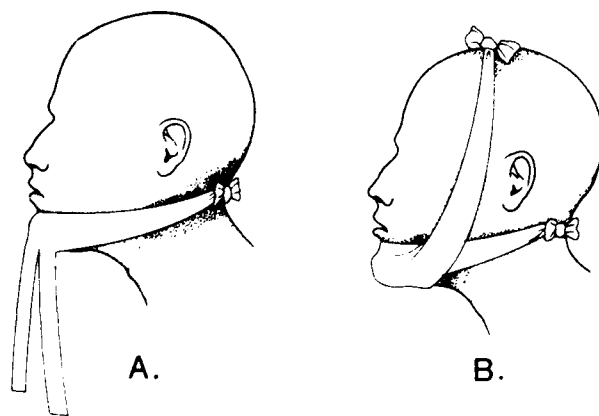
8. The arms, legs, face, or other parts of the body may be partially paralyzed.

9. The victim's face may be very pale, or it may be unusually flushed.

10. The victim is likely to be suffering from shock, but the symptoms of shock may be disguised by other symptoms.

It is not necessary to determine whether or not the skull is actually fractured when you are giving first aid to a person who has suffered a head injury. The treatment is the same in either case, and the primary intent is to prevent further damage to the brain.

TREATMENT. Keep the injured person lying down. If facial flushing is apparent, raise the victim's head and shoulders slightly. If facial pallor is present, position the victim so the head is level with or slightly lower than the body. Watch



136.26

Figure 18-59.—Four-tailed bandage for a fractured jaw.

carefully for vomiting. If the victim begins to vomit, position the head so choking on the vomitus does not occur.

If there is serious bleeding from the wounds, try to control it by applying direct pressure, using caution to avoid further injury to the skull or brain.

You must exercise care when moving or handling the victim. Transport the person only when necessary. If you must transport, keep the victim lying down.

Be sure the victim is kept comfortably warm but do not overheat him. Do NOT give the victim anything to eat or drink. **DO NOT GIVE ANY MEDICATION.**

Finally, obtain medical attention for the victim as soon as possible.

FRACTURE OF THE SPINE

The spinal cord, which contains nerve fibers in direct connection with the brain, is enclosed and protected by a bony structure known as the **SPINAL COLUMN**, or **BACKBONE**. The spinal column is made up of a number of small bones called the **VERTEBRAE**.

If the spine is fractured at any point, the spinal cord may be crushed, cut, or otherwise damaged so severely that death or paralysis will result. However, if the fracture occurs in such a way that the spinal cord is not seriously damaged, there is a good chance of complete recovery—**PROVIDED THE VICTIM IS PROPERLY CARED FOR**. Any twisting or bending of the neck or back, whether due to the original injury or caused by careless handling later, is likely to cause irreparable damage to the spinal cord.

The primary symptoms of a fractured spine are pain, shock, and paralysis. **PAIN** is likely to be acute at the point of fracture. It may radiate to other parts of the body. **SHOCK** is usually severe, but (as in all injuries) the symptoms may be delayed for some time. **PARALYSIS** occurs if the spinal cord is seriously damaged. If the victim is unable to move the legs, feet, or toes, the fracture is probably in the back. If he cannot move the fingers, the neck is probably broken. Remember, however, that a spinal fracture does not always injure the spinal cord, so the victim is not always paralyzed. Any person who has acute

pain in the back or neck, following an injury, should be treated as though a fracture of the spine has occurred. This remains true even though no other symptoms are present.

TREATMENT. First aid for all spinal fractures, whether of the neck or back, has two primary purposes: (1) to minimize shock, and (2) to prevent further injury to the spinal cord.

You must keep the victim comfortably warm. **DO NOT** attempt to place the victim in the position normally used to treat shock. Any unnecessary movement may cause further injury to the spinal cord. Keep the victim lying flat. **DO NOT** attempt to lower the victim's head.

To avoid further damage to the spinal cord, **DO NOT MOVE THE VICTIM UNLESS IT IS ABSOLUTELY ESSENTIAL**. But if you must transport, **DO NOT BEND OR TWIST THE VICTIM'S BODY; DO NOT MOVE THE HEAD FORWARD, BACKWARD, OR SIDEWAYS; AND DO NOT, UNDER ANY CIRCUMSTANCES, ALLOW THE VICTIM TO SIT UP.**

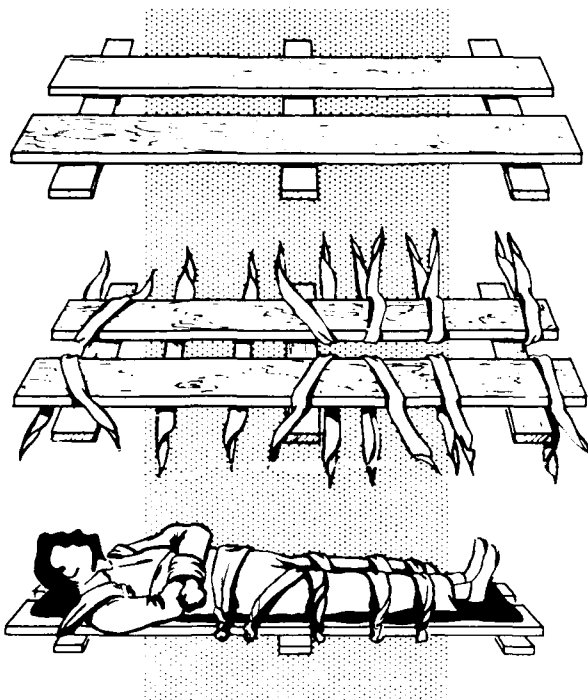
If it is necessary to transport a person who has suffered a fracture of the spine, follow these general rules.

1. If the spine is broken at the **NECK**, the victim must be transported lying flat on his back with the face up. Place pillows or sandbags beside the head so it cannot turn to either side. **DO NOT PUT PILLOWS OR PADDING UNDER THE NECK OR HEAD.**

2. If you suspect the spine is fractured, but do not know the location of the break, treat the injury as though the victim has a broken neck. In other words, the victim should be lying on his back, with the face up. If both the neck and back are broken, treat the victim in the same manner, that is, keep the victim on his back, with his face up.

3. No matter where the spine is broken, **USE A FIRM SUPPORT IN TRANSPORTING THE VICTIM**. Use a rigid stretcher, or use a door, shutter, wide board, or a frame similar to that shown in figure 18-60. Pad the support carefully, and put blankets both under and over the victim. Use cravat bandages or strips of cloth to fasten the victim firmly to the support.

4. Hold the injured person by the clothing, and slide or pull the victim onto the support. **DO**



136.27

Figure 18-60.—Improvised frame for transporting victim with fractured spine.

NOT ATTEMPT TO LIFT THE VICTIM UNLESS YOU HAVE ADEQUATE ASSISTANCE. Remember, any bending or twisting of the body is almost certain to cause serious damage to the spinal cord. If there are at least four (preferably six) people present to help lift the victim, they can probably accomplish the job without much movement of the victim's body. But a smaller number of people should NEVER attempt to lift the victim.

5. GET MEDICAL HELP AT ONCE.

FRACTURE OF THE PELVIS

The large pelvic bones (sometimes called hipbones) and the lower bone of the spinal column together make up the bony structure known as the PELVIS. The joint between the thighbone (the long bone of the upper part of the leg) and the pelvic bone is called the HIP JOINT.

Fractures in the pelvic region often result from falls, heavy blows, and accidents that involve

crushing. The greatest danger in any pelvic fracture is that the organs enclosed and protected by the pelvis may be seriously damaged when the bony structure is fractured. In particular, there is danger that the bladder will be ruptured. There is also danger of severe internal bleeding, because the large blood vessels in the pelvic region may be torn or cut by fragments of the broken bone.

The primary symptoms of a fractured pelvis are severe pain, shock, and loss of ability to use the lower part of the body. The victim is unable to sit or stand. If conscious, the victim may feel as though his body is "coming apart." If the bladder is injured, the victim's urine may be bloody.

TREATMENT. Do not move the victim unless ABSOLUTELY necessary.

Treat the victim for shock. Keep him comfortably warm. Do not attempt to place the victim in the shock position, as this may produce further damage internally.

If you must transport the victim to another place, handle him with the utmost care. Use a rigid stretcher, a padded door, or a wide board. Keep the victim lying on his back, with the face up. In some cases, the victim will be more comfortable if the legs are straight. In other cases, the victim will be more comfortable with the knees bent and the legs drawn up. After you have placed the victim in the most comfortable position, immobilize him by placing bandages around the legs at the knees and ankles. Then place a pillow beside each hip and fasten each pillow securely with bandages or pieces of cloth. Finally, fasten the victim securely to the stretcher or improvised support, and obtain medical help immediately.

FIELD SANITATION

In the field, devices necessary for maintaining personal hygiene and field sanitation must be improvised. Some of the devices for field sanitation which have been tried and used successfully in the field are described next.

LATRINES

If you are on bivouac or at a new location, it is unlikely that you will find a waterborne sewage system available for your use. The usual

alternative is digging a hole (cat hole) about 1 foot deep and covering the feces completely with dirt, or using a latrine.

NOTE: Latrines must be 100 yards from water supplies and messing facilities.

Straddle trench latrines are commonly used. Dig straddle trenches as soon as you arrive at a position. Use the 1:2:3 ratio (trenches 1 foot wide, 2 feet deep, and 3 feet long). No seats are provided, and the men stand along the sides. Add another foot of depth for each day you anticipate using the trench. Keep a pile of dirt and a shovel adjacent to the trench so each man may use some of the dirt to cover his waste materials. Boards may be placed around the sides to help keep steady footing.

When the latrine is filled to within 1 foot of the ground level or is to be abandoned, the following steps should be initiated.

1. Using an approved residual insecticide or diesel fuel, spray the pit contents, the side walls, and the ground surface extending 2 feet from the side walls.

2. Fill the pit to ground level with successive 3-inch layers of earth, packing each layer down before adding the next one; then mound the pit over with at least 1 foot of dirt and spray again with insecticide or diesel fuel. This prevents flies that hatch in the closed latrine from getting out.

If there is a possibility that others may come into the area, it is better to mark the closed latrine so the site will not be used again. A sign **CLOSED LATRINE** with the date of closing should be placed firmly in the earth over the spot.

As soon as possible, regular pit latrines are dug. These may go down 20 to 30 feet if the ground permits. The sides must be straight and have no ledges that could catch any feces. Latrine boxes, usually of four or eight holes, and accessories, such as tent, urinals, tar paper, and screen wire, are furnished ready for installation.

When the box is installed, it is lined with tar paper from the top to the bottom. All boxes also need a metal or tar paper urine deflector. This deflector is converted into a trough under the front of the seat so it drains toward one end. From this end, a pipe carries the urine to an outside

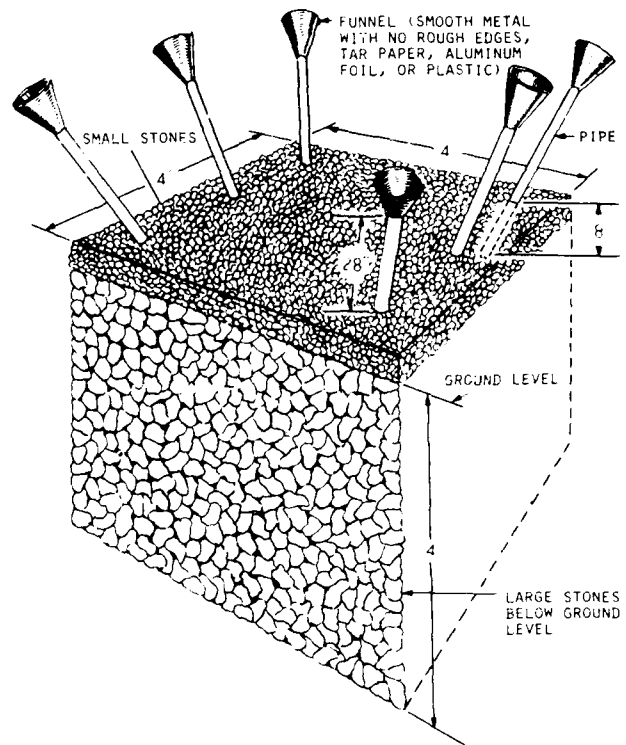


Figure 18-61.—Urinal pipes and soakage pit.

soakage pit. This helps prevent a disagreeable odor from the urine. In some cases where the soil is rather porous, the urine drains into the latrine pit itself.

It is necessary to cover all cracks in the box to help make it flyproof. You do this by nailing strips of wood or tin over them. When the box is placed over the pit, it must be done carefully. If any cracks are showing, seal them by packing some dirt tightly around the edges.

A separate urine soakage pit is built if the latrine pit is in soil that absorbs liquids poorly (fig. 18-61.) This pit is about 4 feet square and 4 feet deep. It is filled with pieces of broken rock, brick, large stone or lava rock to within 1 foot from the top. Then oiled burlap is placed over the rocks and covered with sand or earth. Vents, inserted to reduce odor, are covered at the top with fine mesh screen.

Urinals may be made of 1-inch or large sized pipe and placed at each corner of the pit and along the sides. The pipes should reach at least 8 inches

below the ground surface. In the upper end of each pipe, place a funnel of sheet metal, tar paper, or similar material. These funnels are covered at the opening with wire mesh. This is to keep out flies, cigarette butts, or other items that would clog up the pipes.

In other cases, pail latrines may be used in buildings where no adequate plumbing facilities are available, or where it is not practical to build deep pit latrines. Usually a standard latrine box is adapted for use as a pail latrine. The pails are removed at least once daily and replaced by clean pails. Each pail should have about 1 inch of a 2-percent cresol solution or some slaked lime in it.

Pails of excreta are removed from the latrines by hand, cart, wagon, or truck. The contents may be burned, buried, or placed in flyproof concrete tanks, where it decomposes.

A trough urinal is usually built as part of a latrine. The trough may be made of tin, galvanized iron, or wood. If it is made of wood, it is usually lined with tar paper.

The trough slopes toward one end and empties into a drain pipe. The drain pipe, fitted with a fine mesh fly screen, extends into the latrine or urine soakage pit. Sometimes the pipe is omitted and the trough extends into the pit.

GARBAGE DISPOSAL

Garbage is the waste from the kitchen and mess hall. It is usually divided into two categories—WET and DRY. Both have to be removed from the mess area before they cause offensive odors or attract flies and rats.

Cans are used for storing the garbage until it is removed for disposal. They are kept outside of the kitchen. Covers must be kept on the cans at all times. Cans should not be filled higher than 4 inches from the top. Regular washing of the cans is necessary to help ensure proper sanitation. If steam is available, it may be used to remove any accumulated grease.

The common method of disposal is burial. Trenches or pits are dug and the garbage deposited. Sometimes a continuous trench is used. Each day's garbage is then covered by the excavation made for the following day. The length, width, and depth of the holes vary according to the need. However, do not pile the

garbage higher than 2 feet from the top before covering it with earth.

NOTE: Garbage pits are usually not more than 30 yards from mess areas and not less than 100 yards from water supplies.

Some installations may have facilities to load the garbage on barges. The barges are taken out to sea and the garbage dumped. Where available, movable platforms accomplish this without the need of handling the garbage again.

A few installations burn dry garbage. This method of disposal should be used whenever possible because it is quick and inexpensive.

LOW-TEMPERATURE CLIMATES

In low-temperature areas, such as the Arctic, the problem of sewage and garbage disposal is more difficult than in temperate areas. The difficulty is due to the effect of the low temperature on the physical state of fluids, soils, and other materials involved in garbage and sewage disposal.

The biological and chemical reduction of organic material is a slow process in areas with low-temperature conditions. The soil will not assimilate wastes as readily as under temperate conditions, and permafrost (permanently frozen ground) often will not permit proper drainage of the soil. In addition, most solids, as well as liquids, will show a decline in solubility with a decline in temperature. These and other factors have an important bearing on the type of sewage and garbage disposal methods used in the Arctic or other low-temperature areas. Let us consider briefly a few temporary methods suitable for use in such areas.

In severely cold weather, feces deposited by troops will freeze quickly, and when pulverized by wind and snow can soon contaminate a whole area. Sometimes, on a march, a SNOW HOLE may be used, but it should be placed near a rock or terrain feature that will ensure against other troops bivouacing on the same spot at a later date.

DISPOSAL BAGS offer a good means of preventing the spread of contaminated material and should be used whenever possible. These bags are collected and stacked under rock piles, then disposed of later by dumping on the ice of

adjacent bodies of water. The bags present no problem while frozen, and they cannot be scattered until the thaw begins.

In forward bivouacs, you can expect to find a very simple facility, such as a **SLIT TRENCH** in the snow, protected by a windbreak. The slit trench should be located in close proximity to the group. Marking prevents other troops from bivouacing on the same spot at a later date.

In a more permanent type of camp, a heated shelter probably will be provided. This may be a tent or prefabricated unit in which there is a portable folding box latrine. All forms of latrines should be marked with the dates they are closed.

WATER TREATMENT

Safe water in sufficient amounts is essential to field troops. Water not properly treated can give you diseases, such as typhoid fever, dysentery, cholera, and common diarrhea. In certain areas of the world, water may also transmit infectious hepatitis and amebic dysentery. The latter diseases are caused by organisms that are highly resistant to the water disinfection methods normally used.

The quantity of water required for troops varies with the season of the year, the geographical area, and the tactical situation. Dehydration may be the problem in both extremely hot and cold climates. In extremely hot climates, large quantities of drinking water are required to replace body fluid losses. In extremely cold climates, body fluid losses are not as great as in hot climates; however, water is needed in the reconstitution of dehydrated foods. Additional water is also required for maintenance of personal hygiene in both hot and cold climates. A guide for planning to meet the water requirements in a temperate zone is 5 gallons per man per day for drinking and cooking and at least 15 gallons per man per day when showering facilities are to be made available.

You may not be able to obtain water from water points set up by the *Utilitiesman*. If this should occur, you must obtain and treat your own water. The possible sources of water are surface water (lakes, rivers, streams, and ponds), ground water (wells and springs), rain collected from roofs or other catchment surfaces, melted blue ice or snow, and distilled water. The cleanest source

of water available should be selected. Water taken from any source must be properly treated before being used, as all sources must be presumed to be contaminated.

To treat water for drinking, you can use either a plastic or aluminum canteen with the water purification compounds available in tablet form (iodine) or in ampule form (calcium hypochlorite).

Before using iodine tablets, check them for physical change, as they lose their disinfecting ability with age. If the tablets are stuck together, crumbled, or have a color other than steel gray, do not use them. When treating water in your canteen with iodine tablets, fill the canteen with the cleanest, clearest water available. Add one iodine tablet to a 1-quart canteen of clear water; add two tablets if the water is cloudy. Double these amounts for a 2-quart canteen. Place the cap on the canteen loosely; wait 5 minutes; then shake the canteen well, allowing leakage to rinse the threads around the neck of the canteen. Tighten the cap and wait an additional 20 minutes before using the water for any purpose.

To purify water in a 1-quart canteen with calcium hypochlorite ampules, fill the canteen with the cleanest, clearest water available, leaving an air space of an inch or more below the neck of the canteen. Take your canteen cup and fill it half full of water. Add the calcium hypochlorite from one ampule, and stir with a clean stick until the powder has dissolved. Fill the cap of a plastic canteen half full of the solution from the canteen cup and add it to the water in the canteen, then place the cap on the canteen and shake it thoroughly.

NOTE: If you have a 1-quart aluminum canteen, add at least 3 capfuls of the solution to the canteen, as its cap is much smaller than the one on the plastic canteen.

Loosen the cap slightly and invert the canteen, letting the treated water leak onto the threads around the neck of the canteen. Tighten the cap on the canteen and wait at least 30 minutes before using the water for any purpose.

You might save the remaining solution to use later if additional treated water is needed, or you can discard it.

When you do not have disinfecting compounds, boiling the water is another method

for killing disease-producing organisms; however, it has several disadvantages: (1) fuel is needed, (2) it takes a long time to bring the water to a boil, and then allowing it to cool, and (3) there is no guaranteed protection against recontamination. Water must be held at a rolling boil for at least 15-20 seconds to make it safe for drinking.

Hand-washing devices which are easy to operate are usually provided at appropriate places in the bivouac area: outside the latrine enclosures, near the mess area, and at other locations as needed. A soakage pit is provided under each device to prevent water from collecting. The water containers for these devices are usually checked by the Utilitiesmen to ensure the containers and the surrounding area are kept clean.

In the field you must care for your own mess kit. Proper washing is important; otherwise food particles will remain and become breeding places for disease germs.

The galley maintenance personnel usually set up three corrugated cans or other similar containers, placed in a row, for washing your mess kit. The first can contains hot water with soap or detergent, the second and third cans contain clear water which is kept boiling throughout the washing period (fig. 18-62). A long-handled washbrush and a garbage can are furnished.

To clean your mess kit properly, follow the steps given below.

1. Scrape the food particles from your mess kit into the garbage can.
2. Wash the kit in the first container of hot soapy water, using the long-handled brush.
3. Rinse the kit in the second can of boiling water by dipping it up and down several times.
4. Disinfect the kit by immersing it in the third container of boiling water for several seconds.

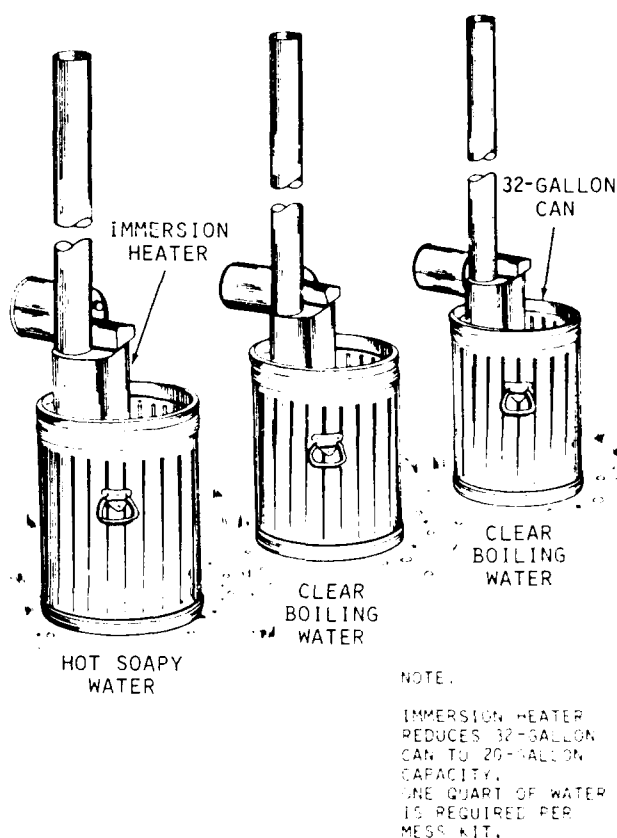


Figure 18-62.—Immersion heaters for mess kit washing setup.

5. Shake the kit to remove excess water and allow it to dry in the air; then close the kit to keep out dust and vermin.

If the mess kit becomes soiled or contaminated between meals, it should be rewashed prior to use.

When desirable to preheat utensils prior to the meal, a corrugated can with clear boiling water is placed near the start of the serving line. It is important that such water be maintained at a rolling boil throughout the meal service period.

CHAPTER 19

CHEMICAL, BIOLOGICAL, AND RADIOLOGICAL (CBR) DEFENSE

Although chemical and biological warfare have been outlawed by international agreements, the potential for such warfare is very real. Likewise, radiological or nuclear warfare is an ever-present concern to all SEABEES, as well as all U.S. service personnel. The first part of this chapter discusses the effects of chemical, biological, and radiological (CBR) weapons on personnel and equipment. This information includes the symptoms of CBR poisoning and its first aid treatment. The next section discusses SEABEE CBR defense responsibilities in detail. Individual protective measures and CBR defense equipment are discussed in this section. Completing the SEABEE mission while under CBR conditions is also covered in this chapter. The last two topics are CBR defense training and marking contaminated areas.

CBR Defense Readiness Policy states that mission accomplishment in a CBR environment is dependent on two basic requirements:

1. The individual SEABEE must have been trained to take those actions necessary to ensure survival during a CBR attack.
2. SEABEE units must have been trained to perform their assigned missions in a CBR contaminated environment.

So these basic requirements can be fulfilled, CBR training needs to be integrated into all facets of individual and unit training. Sufficient training time must be allocated to ensure that actions required for initial survival and subsequent mission accomplishment are conditioned responses.

EFFECTS OF CHEMICAL WEAPONS

Chemical agents are used to produce death, injury, temporary incapacitation, or irritating effects. (Screening smokes are not toxic unless inhaled in large amounts like any other smoke. Incendiaries are used primarily to start fires. These two agents are not discussed further.)

Broadly speaking, there are three types of antipersonnel agents: casualty, incapacitating, and harassing.

CASUALTY AGENTS are highly poisonous and are intended to kill or seriously injure. Included in this group are nerve, blister, choking, and blood agents. Nerve agents, as a group, are probably the most effective because only small doses are needed to produce death. Some agents are so persistent (when dispersed as a liquid) that they can remain effective for several days. They enter the body by the victim's breathing or swallowing or through the victim's skin. Blister agents cause severe burns, blisters, and general destruction of body tissue. If they are inhaled, the lungs are injured. Choking agents inflame the nose, throat, and particularly the lungs. Blood agents interfere with the distribution of oxygen by the blood.

Some casualty agents have a cumulative effect, which means that successive doses add to the effect of each preceding dose. You might receive a nonlethal dose of a nerve agent, for example, followed within a few hours by another nonlethal dose. The cumulative effects of the two exposures, however, could be sufficient to cause death.

A new development is the **NONLETHAL INCAPACITATING AGENT**. It renders personnel incapable of performing their duties by interfering with the mental processes that

control body functions. Reactions vary among individuals. One person might go into shock, and still another might have a feeling of extreme fatigue. These agents are difficult to detect because most of them are colorless, odorless, and tasteless.

HARASSING AGENTS include tear and vomiting gases that cause temporary disability. Tear gases are used mainly for controlling riots, but they have been used in warfare with varying degrees of success. Without a gas mask, the individual is rapidly incapacitated, but the effects disappear in 5 to 10 minutes after the person dons a protective mask or gets to fresh air.

Vomiting gases are useful if the enemy intends to launch an attack with casualty agents. They cause extreme nausea and vomiting, requiring those who have been exposed to remove their masks, thus exposing personnel to the casualty agents.

EFFECTS OF BIOLOGICAL WEAPONS

Biological operations use living organisms to cause disease or death. They act on living matter only. Most organisms that produce disease enter the body of the victim and grow in the human tissues. Some organisms produce toxins (poisons) in food or water, and the poison causes disease after the victim eats or drinks it.

Large-scale biological attacks by an enemy are as yet an untried weapon. As far as it is known, there has been no open attempt by any country to use this form of attack. Biological agents, however, have certain characteristics that favor them over other types of warfare, and the possibility of their use in the future must be anticipated. Only small amounts of the agents are needed, because the organisms are alive and multiply in the victims. Moreover, they are difficult to detect and slow to identify. A whole ship's company might be infected before the medical department realized a disease existed on board.

The most efficient means of delivering biological agents on a large scale is through aerosols, which generally are invisible and odorless. Aerosols can be released from aircraft in bombs or direct sprays, from surface vessels on

onshore winds, or from any number of explosive munitions, such as projectiles, guided missiles, and rockets.

Animals and insects can be used as carriers to spread biological agents.

Another method of quickly infecting large numbers of people is for saboteurs to contaminate a water supply. Diseases such as typhoid fever, cholera, and influenza can be spread by infecting water, milk, and food supplies with the proper microorganisms.

EFFECTS OF NUCLEAR WEAPONS

Nuclear weapons produce explosions of great force and heat and release nuclear radiation. Their primary purpose is the mass destruction of property and personnel. Their effects are divided into three categories: blast, heat, and nuclear radiation.

BLAST

Injuries caused by blast can be divided into primary (direct) injuries and secondary (indirect) injuries. Primary blast injuries result from the direct action of the air shock wave (overpressure) on the human body. The greater the weapon's size, the greater the blast wave's effective range will be with a subsequent increase in casualties.

Secondary blast injuries are caused mainly by collapsing buildings and by timber and other debris flung about by the blast. Personnel may also be hurled against stationary objects or thrown to the ground by high winds accompanying the explosion. Injuries sustained are similar to those resulting from a mechanical accident, such as bruises, concussions, cuts, fractures, and internal injuries.

At sea, the shock wave or base surge accompanying an underwater burst will produce various secondary injuries. Casualties resemble those caused by more conventional underwater weapons, such as mines and depth charges, but instead of being localized, they extend over the entire ship. Injuries also will result from personnel being thrown against fixed objects or structures. Equipment, furniture, boxes, and similar gear, when not secured properly, can act as missiles and cause many injuries.

Frequently, hemorrhage and shock are serious complications of blast injuries. The importance of shock cannot be overemphasized, because it is often the main consideration in determining the fate of the patient.

HEAT

Heat from nuclear weapons causes burns. These burns can be grouped into two categories: primary and secondary. Primary burns are a direct result of the thermal radiation from the bomb. Secondary burns are the result of fires caused by the explosion.

As with blast injuries, shock is commonly associated with extensive burns. Burns are also subject to infection, which may produce serious consequences.

Flash burns are likely to occur on a large scale as a result of an air or surface burst of a nuclear weapon. Because thermal radiation travels in straight lines, it burns primarily on the side facing the explosion, but under hazy atmospheric conditions, a large proportion of the thermal radiation may be scattered, resulting in burns received from all directions. Depending on the size of the weapon, second degree burns may be received at distances of 25 miles or more.

The intense flash of light that accompanies a nuclear burst may produce flash blindness, even at a range of several miles. Flash blindness is normally of a temporary nature since the eye can recover in about 15 minutes in the daytime and in about 45 minutes at night. A greater danger lies in receiving permanent damage to your eyes caused by burns from thermal radiation, which may occur 40 miles or more from a large-yield nuclear weapon.

NUCLEAR RADIATION

Nuclear radiation consists of four types: alpha and beta particles, neutrons, and gamma rays.

ALPHA and BETA particles can be ignored as initial radiation because they are very short ranged; however, they can be a hazard as residual radiation. Alpha particles have little penetrating power, but if they are ingested into the body, they can cause serious harm. Beta particles also are of little concern unless they are on the body (in dust, dirt, and so forth) or get into the body.

NEUTRONS are a direct hazard only during the initial radiation phase and then only in the general area of ground zero. In the residual phase, however, they cause whatever material absorbs them to become radioactive and emit gamma rays and beta particles.

GAMMA RAYS (similar to, but more powerful than, X rays) are the most hazardous form of radiation. They can travel long distances in air and have great penetrating power, making it difficult to provide sufficient shielding to protect personnel.

Radiation hazards are of three types: PENETRATION DOSE, SKIN DOSE, and INTERNAL CONTAMINATION. Penetration doses and internal contamination have the most serious effects. You can be protected against penetration doses by proper shelter. You can avoid internal contamination by wearing the protective mask and not eating or drinking food and water until they are declared safe. Skin doses, which cause injuries similar to burns, can be reduced by your wearing of proper battle dress.

CBR CONTAMINATION DETECTION AND IDENTIFICATION

For SEABEES to carry out their mission, they must be able to detect and identify CBR agents immediately. The very nature of CBR agents, however, makes it difficult to detect and identify them.

In a nuclear attack, for instance, you know an attack is taking place because you can see it, hear it, and feel it. But you can't see the nuclear radiation, which can be just as deadly over a period of time as the blast itself. In the same invisible way, biological agents can be present with the possibility of no one knowing until it is too late. Recent developments in chemical operations make some of the chemical agents colorless and odorless. You must be able, therefore, to recognize them whenever you or your shipmates are victims.

You must learn the symptoms of each type of attack so that you can take the proper action when exposed and so that you can apply the correct self-aid and first aid measures.

SYMPTOMS OF CHEMICAL AGENT CONTAMINATION

Chemical agents will make you a casualty when your body comes in contact with a bigger dose than it can withstand. The limits of tolerance of the human body extend from short periods of exposure and low concentrations of certain agents to extended periods of exposure to high concentrations of certain other agents. Furthermore, the limits of tolerance to specific agents vary with individuals. In any event, your principal concern is recognizing the symptoms and relieving the effects of exposure before the limit of exposure is exceeded.

Nerve Agent Symptoms

Symptoms of nerve agent contamination are a runny nose; tightness of chest with difficulty in breathing; contraction of eye pupils; and nausea, cramps, headache, coma, and convulsion. All of these symptoms can take place in 30 seconds if the dose is sufficiently heavy.

Vapors of the G- or V-series nerve agents, even in low concentrations, cause contraction of the eye pupil. This action affects the sight, especially in dim light, and induces a headache. After a brief exposure to the vapors, a feeling of tightness in the chest may be noticed, which increases the deep breathing. The liquid substance does not injure the skin, but penetrates it and poisons the body. Contraction of the pupils, in such an instance, may not appear as a warning sign.

A 1- to 5-minute exposure of personnel not wearing protective masks to low concentrations of G- or V-agent vapors causes difficulty in vision. Slightly greater exposures cause headache, nausea, pain in the chest, and more serious visual difficulties. Exposure of the unbroken skin to vapor alone, however, entails little danger of serious injury.

Liquid contamination from a nerve agent to the skin is a real hazard. One of the first signs of exposure when liquid contaminates the skin may be excessive sweating and twitching of the muscles at the site of contamination. Small amounts of liquid left undisturbed on the skin can cause death in a matter of a few minutes. Entrance to the body is even more rapid through the eye surfaces and through the linings of the mouth and

nose. A lethal dose can be absorbed as rapidly by getting the liquid in the eyes as by inhaling concentrated vapor. When poisonous vapors are swallowed, the first symptoms are excess flow of saliva, intestinal cramps, nausea, vomiting, and diarrhea. If the nerve agent is absorbed into the system after the victim is exposed to liquid or vapor, the symptoms may be generalized sweating, difficulty in breathing, muscular weakness, and eventually convulsions, paralysis, and unconsciousness.

Blister Agent Symptoms

Immediate contact with LIQUID MUSTARD or MUSTARD VAPOR causes no eye or skin pain or any other immediate symptoms. Exposure to mustard gas for more than half an hour, however, produces these symptoms: Half an hour to 12 hours after exposure, the contaminated eyes water, feel gritty, and become progressively sore and bloodshot. The eyelids become red and swollen. Infection frequently results.

Mustard vapor will burn any area of the skin, but the burn will be most severe in moist areas (neck, private parts, groin, armpits, bends of knees, and elbows). Redness of the skin follows in one half to 36 hours after exposure. This condition may be accompanied by intense itching, and blisters may then appear. Stiffness, throbbing pain, and swelling may also be observed.

A few hours after breathing the mustard vapor, a victim experiences irritation of the throat, hoarseness, and coughing. After severe exposure, the lining of the respiratory system swells and interferes with breathing. Frequently, pneumonia develops.

If the whole body is exposed to mustard vapor, the body goes into a state of shock. This reaction is accompanied by nausea and vomiting.

NITROGEN MUSTARDS irritate the eyes before they affect the skin or respiratory system. The action of nitrogen mustards on the eyes occurs in a shorter time than does mustard. Even low concentrations of these agents may seriously decrease the vision during or shortly after exposure. Later effects are similar to those of mustard. Contact of these agents with the skin produces damage like that produced by mustard, and their effects on the respiratory system are also similar.

Blood Agent Symptoms

Symptoms produced by blood agents, such as HYDROGEN CYANIDE, depend upon the concentration of the agent and the duration of the exposure. Typically, either death occurs rapidly or recovery takes place within a few minutes after removal of a victim from the contaminated area. If a victim inhales a high concentration of a blood agent, the victim begins to breathe more deeply within a few seconds, has violent convulsions after 20 to 30 seconds, stops breathing regularly in 1 minute, then gives occasional shallow gasps, and finally the heart stops only a few minutes after the onset of exposure. After moderate exposure, giddiness, nausea, and headache appear very early, followed by convulsions and coma. Long exposure to low concentrations may result in damage to the central nervous system. Mild exposure may produce headache, giddiness, and nausea, but usually recovery is complete.

The effects of CYANOGEN CHLORIDE combine the properties of two agents—chlorine and cyanogen. The chlorine properties induce coughing, dryness of the nose and throat, tightness across the chest, and smarting and watering of the eyes, resulting finally in the accumulation of fluid in the lungs. Cyanogen is similar to hydrogen cyanide and, like that agent, causes giddiness, headaches, unconsciousness, convulsions, and death.

Choking Agent Symptoms

In low concentrations, choking agents produce an action on the respiratory system that results in the accumulation of fluid in the lungs. This effect may lead to death. High concentrations produce death for the same reason, but the upper respiratory tract may be involved as well. Exposure to choking agents may produce immediate dryness of the throat, coughing, choking, tightness across the chest, headache, nausea, and at times smarting and watering of the eyes. Symptoms usually are delayed, however, and it is possible that no immediate symptoms will appear when you are exposed to a fatal dose.

Even a mild exposure to a choking agent that is accompanied by immediate symptoms may cause fluid to accumulate in the lungs in from 2 to 24 hours after exposure. The presence of

this fluid is indicated by shallow and rapid breathing, hacking and painful cough, frothy saliva, and an ashen-gray color of the skin.

Vomiting Agent Symptoms

Exposure to vomiting agents is followed soon by a pepperlike burning of the eyes, nose, throat, and air passages. The burning sensation is accompanied by a flow of tears and by repeated coughing and sneezing. These symptoms increase in severity for several minutes, even after the victim dons a mask. The victim becomes sick to the point of vomiting. When the mask is removed, the victim is then exposed to even more hazardous agents.

Tear Agent Symptoms

Tear agents (also called riot control agents) are local irritants which, in low concentration, act primarily on the eyes, causing intense pain and a considerable flow of tears, stinging of moist, warm skin, and irritation of the nose. High concentrations affect the upper respiratory tract and lungs and cause nausea and vomiting. The agents may be either solids or liquids and may be dispersed as vapors or smokes. The newest agent, CS, is the most effective, causing incapacitation 20 to 60 seconds after exposure. Recovery can be expected 5 to 10 minutes after removal to fresh air.

Incapacitating Agent Symptoms

Incapacitating agents can cause mental symptoms and may also produce physical symptoms such as staggering gait, dizziness, and blurred vision. Some of these agents cause fainting spells and others cause severe muscle weakness. The mental symptoms often resemble alcoholic drunkenness; for example, individuals may act silly, giggle, or become angry and belligerent similar to a "fighting drunk." Sometimes incapacitating agents can cause hallucinations. (Like alcoholic "DTs," victims may imagine that they see snakes or enemy soldiers, or they may imagine that colors have changed.) Many of these incapacitating gases prevent sleep. Some people may stay wide awake for 4 days and be mentally confused for the whole period. These agents do

SEABEE COMBAT HANDBOOK

not kill, but they can make a man unfit for duty. Many of them do not produce effects until several hours after inhalation. These effects can last from 8 hours to 4 days.

SYMPTOMS OF BIOLOGICAL CONTAMINATION

In the early stages of any biological disease, the general symptoms are fever, malaise, and inflammation.

The degree of fever varies with the individual, depending on his resistance, but it does serve as a rough guide to the severity of infection. Often the fever is preceded by a violent chill. Whether the chill occurs or not, the fever is usually one of the earliest symptoms.

Malaise is a feeling of bodily discomfort and weakness. There may be nausea, dizziness, loss of appetite, and general aches and pains.

Inflammation is caused by the reaction of body tissues combating and sealing off an infection. In almost every case there is pain, redness, and swelling. Some types of infection result in a characteristic rash, making it possible for the doctor to make an early diagnosis.

NUCLEAR RADIATION SYMPTOMS

The first symptoms of exposure to nuclear radiation are nausea and vomiting. Later (2 weeks or more) symptoms are diarrhea, loss of hair, loss of weight, sore throat, and skin hemorrhage. Death rates depend on the amount of the dose and the general physical condition of the victim. Unless a very heavy dose is received, ultimate recovery can be expected in most instances.

SEABEE CBR DEFENSE RESPONSIBILITIES

The battalion commander is responsible for planning the overall CBR defensive measures for a SEABEE encampment. He then presents to the battalion those requirements for defense measures which should be provided by other forces.

Protective measures used against other weapons give only partial protection against CBR

attacks. Provisions must be made for CBR defense, such as the following:

- Greater emphasis must be placed on unit separation, dispersion, and mobility.
- Increased air and ground reconnaissance.
- Training and indoctrination of personnel.
- Warning, reporting, detection, and identification of CBR agents and hazards.
- Individual and collective protection.
- Decontamination of personnel, equipment, supplies, and terrain when directed.
- Plans for handling mass casualties, to include medical operations and first aid.

CHEMICAL DEFENSE

The best defense against a chemical attack is constant monitoring with equipment to detect chemical agents as soon as possible. To provide adequate time to take protective measures, commanders should use all available chemical detection equipment.

The protective measures taken by individuals and units when operating under the threat of chemical attack or in a chemical environment are governed by the nature of the threat, mission, situation, and the weather. Movement of troops and supplies should be planned so that contaminated terrain is avoided to the maximum extent possible. Contaminated terrain is crossed only when absolutely necessary and then as quickly as possible. Preferably, you should move in vehicles at speeds and intervals that minimize contamination of following vehicles. If the situation and mission permit, heavy work rate activities of personnel dressed in chemical protective clothing and equipment should be minimized. Essential work should be planned for the coolest part of the day, if possible.

Protective Measures Before Chemical Attack

In any combat situation the commander should designate a level of Mission-Oriented

Protective Posture (MOPP) for the unit. MOPP is discussed in detail later in this chapter. The following protective measures must be taken before a chemical attack.

EXTENDED WEAR OF PROTECTIVE CLOTHING.—Based on the MOPP level designated by the commander, the individual may have to adapt to requirements for wearing his protective clothing and equipment for extended periods. The amount of time required to put all of these items on during a chemical attack will usually be longer than the amount of time required to receive a casualty-producing dose of chemical agent.

M9 CHEMICAL AGENT DETECTOR PAPER.—The M9 chemical agent detector paper (fig. 19-1) detects the presence of liquid chemical agents encountered by the individual. It will NOT detect chemical agent vapors. The paper will indicate the presence of a nerve agent (G and V) or a blister agent (H and L) by turning a red or reddish color.

The M9 paper is self-adhesive; you can attach it to most surfaces. When you attach it to clothing, place it on the upper portion of the right arm, left wrist, and either the left or right ankle to allow adequate representation of contamination encountered by the SEABEE. When you place it on a piece of equipment, it must be in a location free of dirt, oil, and grease and where it will not be stepped on. The M9 paper may be used in any weather, in temperatures above 32 degrees Fahrenheit (F°) or 0 degrees Celsius (0°C).

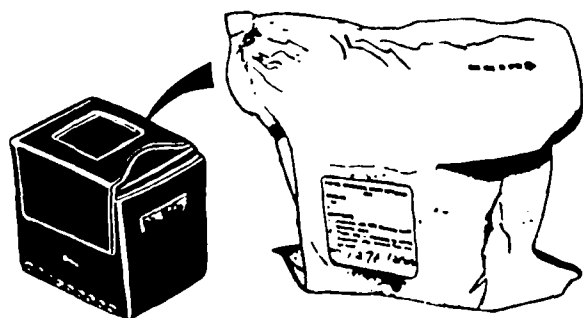


Figure 19-1.—M9 chemical agent detector paper.

However, take care not to expose it to extremely high temperatures, scuffs, or certain types of organic liquids and DS-2, as they all cause false readings. If spots or streaks on the paper appear pink, red-brown, red-purple, or any shade of red, assume it has been exposed to a chemical agent.

ALERTNESS AND PROFICIENCY.—Individuals must remain alert and constantly aware of the chemical threat, especially when duty requirements preclude the wearing of full protective equipment. Individuals must understand the chemical alarms and signals and be proficient in attaining the maximum level of protection when alerted to a chemical attack.

PROTECTION OF INDIVIDUAL EQUIPMENT.—To the extent possible, individuals must protect equipment and supplies against liquid chemical agent contamination by keeping them organized and covered. Hastily constructed fighting hole covers, ponchos, shelter halves, or other suitable materials can be used for protection. Individuals should wear full protective clothing and equipment when sleeping and, to the extent possible, cover themselves and their equipment before they go to sleep.

Protective Measures During Chemical Attack

A chemical attack may come directly in the area in which individuals are located or upwind from that area. In either case, when alerted to a chemical attack, they must take the following immediate defensive actions:

- Don protective mask.
- Give the alarm.
- Continue the mission and wait for further orders.
- If the situation permits, assist others who need help.

Individual Measures After Chemical Attack

Whether an attack comes in the form of a vapor, aerosol spray, or a liquid agent, remain

in protective gear and continue your mission. When time and the mission permit, give first aid to any casualties in the immediate vicinity, and report the local casualty status to the appropriate authority. All personnel must await the commander's order for unmasking. After a chemical attack, **DO NOT UNMASK UNTIL AUTHORIZED BY YOUR IMMEDIATE COMMANDER.** In the absence of command guidance, the procedures described below should be followed.

PROCEDURE WHEN A DETECTOR KIT IS AVAILABLE.—Use a chemical agent detector kit to test for the presence or absence of chemical agents.

After determining the absence of agents, two or three individuals should unmask for 5 minutes, then remask. Check for chemical agent symptoms. If no chemical agent symptoms appear in 10 minutes, the remainder of the troops may safely unmask. Bright light will cause contraction of the pupils, which could be erroneously interpreted as a nerve agent symptom.

PROCEDURE WHEN A DETECTOR KIT IS NOT AVAILABLE.—Observe animal life within your surrounding area for symptoms of chemical agent poisoning. If the local animals appear affected by a chemical agent and, if it does not impede with your mission, move to an area where the animals appear normal before you attempt the procedures listed below. These procedures should also be used in an extreme emergency. Two or three individuals are selected to take a deep breath, hold it, break the seal of their masks, and keep their eyes wide open for 15 seconds. They then clear their masks, reestablish the seal, and wait for 10 minutes. If no symptoms appear after 10 minutes, these same individuals again break the seal, take two or three breaths, and clear and reseal the mask. After another 10-minute wait, if no symptoms have developed, these same individuals unmask for 5 minutes and then remask. After this procedure, if no symptoms have appeared, the remainder of the group can safely unmask. However, remain alert for the appearance of any chemical symptoms. If symptoms occur, resume the wearing of masks.

Protection of Unit Equipment and Supplies

Because contaminated equipment and supplies pose a threat to personnel, covers should be used to protect equipment and supplies stored outdoors, if possible. The following guidance is appropriate for combat, combat support, and combat service support units.

EQUIPMENT.—Important items of equipment must be covered. Plastic sheets serve as excellent covers because they are nonporous. If plastic material is not available, tarpaulins or other suitable material may be used. If nothing else is available, dense foliage will provide some protection.

PACKAGED FOOD ITEMS.—Vapor, aerosol spray, or liquid chemical agents can contaminate food. The type of food, type and amount of agent, and effectiveness of protective measures influence the edibility of food. Food not in protective packages generally presents the major problem. Chemical agents may penetrate packaged food if it is left exposed over an extended time.

UNPACKAGED FOOD ITEMS.—Oily and fatty unpackaged foods are particularly vulnerable to chemical contamination. These foods are protected from contamination when stored in containers, such as field ice boxes and refrigerators, if the sealing gaskets are serviceable. As a rule of thumb, **CONTAMINATED UNPACKAGED FOOD MUST NOT BE EATEN!**

WATER.—Medical personnel are responsible for recommendations on the potability of water. Water that is not in sealed containers may become contaminated. Water suspected of contamination will not be consumed until tested and declared safe.

First Aid and Self-Aid

First aid includes the immediate actions required to prevent further injury or complications from the effects of chemical agents. This necessarily includes the prompt removal of agents from the eye and decontamination of the skin to avoid casualties from lethal liquid agents. Therefore, first aid must include

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performing self-aid, or personal decontamination, automatically and without orders when it is required. First aid also includes the use of appropriate medications or actions to reduce the effects of the agent, such as the use of the nerve agent antidote injector for nerve agent poisoning. Each individual must be thoroughly trained in both first aid and personal decontamination so that he can perform these actions quickly.

UNIDENTIFIED CHEMICAL AGENTS.—
In most cases, the individuals will not be able to

identify the chemical agent used in the attack. When exposed to an enemy chemical attack while dressed in chemical protective clothing and equipment, he will not normally be concerned with immediate decontamination.

When an individual's skin becomes contaminated, it must be decontaminated immediately. Skin decon is the neutralization or removal of contamination from exposed portions of the skin. The individual performs the decon by using M258A1 skin decon kit (fig. 19-2). This kit is designed for chemical decon, but it can be used

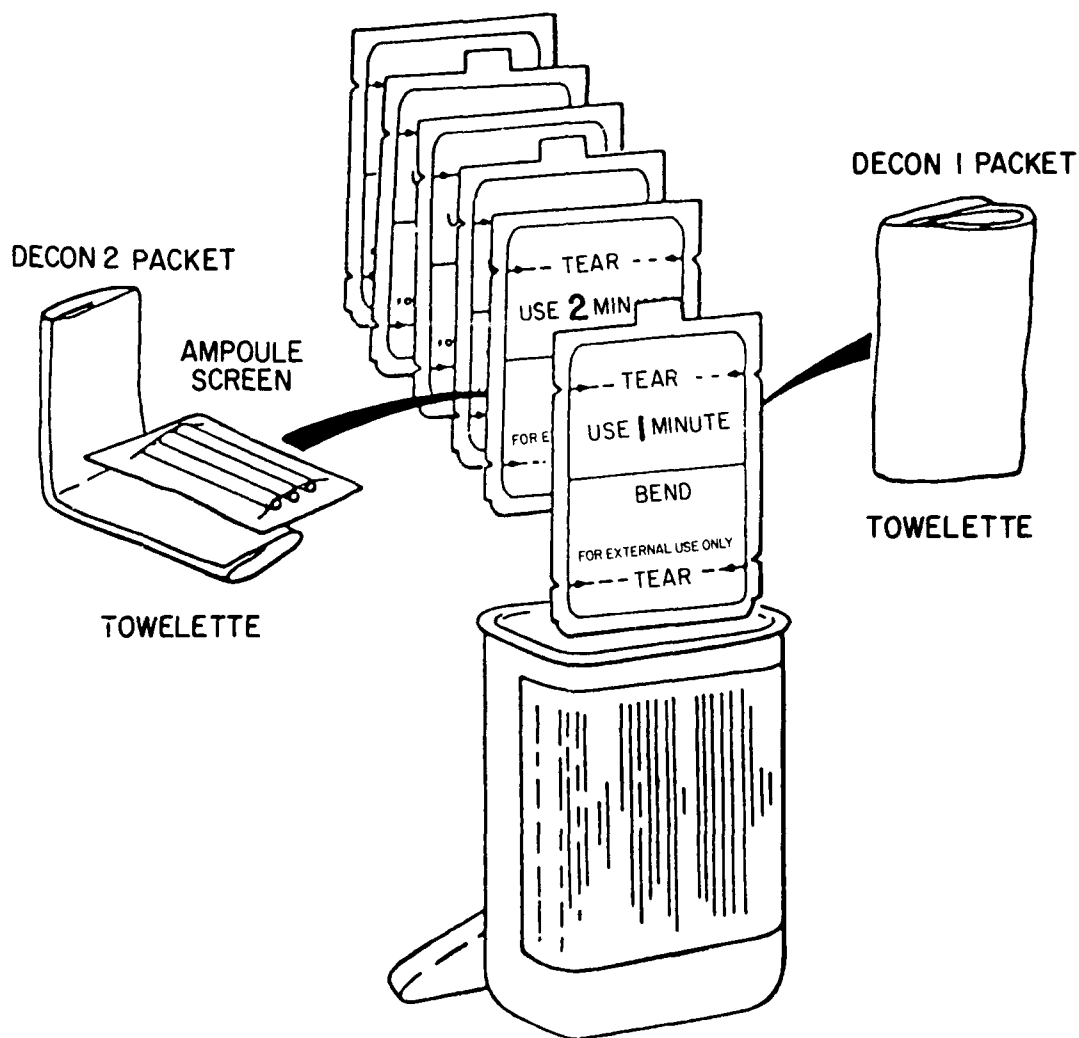


Figure 19-2.—M258A1 skin decontamination kit.

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to remove radiological contamination. If the contaminated person is incapacitated, another person must perform the decontamination to permit him to survive.

For decontaminating skin, each SEABEE receives the M258A1 kit in a hard plastic case. Avoid getting decontaminants into eyes, open wounds, or mouth. If contaminants enter these areas, flush them with water. If symptoms appear, seek medical attention as soon as possible. The kit is normally attached to the protective mask carrier or the load-bearing equipment (LBE). It contains three sets of foil-packaged towelettes saturated with different decontaminating solutions. These solutions neutralize most nerve and blister agents.

Protect the kit from temperatures above 110°F (43°C) and below 32°F (0°C). The solutions are flammable and unstable in storage at temperatures above 110°F (43°C) or for prolonged periods of time in sunlight.

Shelter is necessary to prevent further contamination during the decontamination process. If no overhead cover is available, throw a poncho or shelter half over the head before beginning decontamination.

CAUTION

DO NOT LET THE SOLUTION
FROM THE M258A1 KIT GET
IN THE EYES!

NERVE AGENTS.—If you are told that your pupils are getting very small, or if you are having trouble breathing and your chest feels tight, use the atropine nerve agent antidote kit (NAAK) Mark I.

The injectors contain medications to treat the initial symptoms of nerve agent poisoning. But, most importantly, it will check the more serious effects of nerve agent sickness. The injectors are antidotes, not a preventive device; therefore, only use the injectors if you actually experience symptoms of nerve agent poisoning. (See fig. 19-3.) The directions for use are as follows:

1. Put on the protective mask.
2. Remove a (NAAK), Mark I, from the protective mask carrier.
3. Inject the thigh with the first injector from the kit (atropine, small autoinjector). (See fig. 19-4.) Hold the injector against the thigh for at least 10 seconds. Remove the injector.
4. Follow immediately with the second injector (2-PAM chloride, large injector) and inject the thigh. Hold the injector against the thigh for at least 10 seconds.
5. Remove the injector and place each injector needle through the pocket flap of the overgarment. Bend each needle to form a hook.
6. Massage the area of injection, if time permits.
7. The interval between injecting each set of autoinjectors is 10 to 15 minutes if symptoms persist or recur. A SEABEE must not administer more than three NAAK sets. The administration of more than three sets must be authorized by medical support personnel.

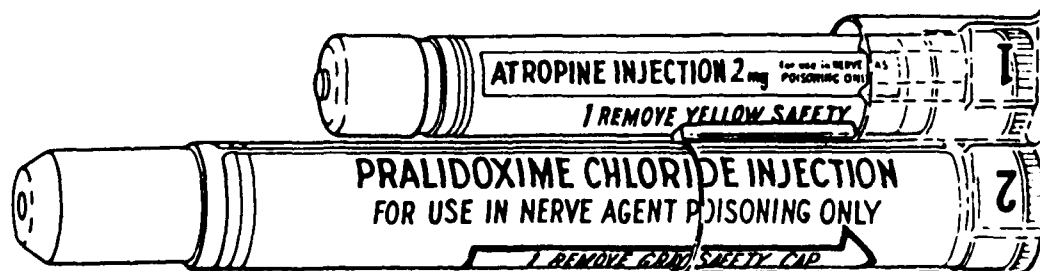
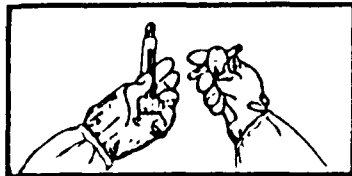


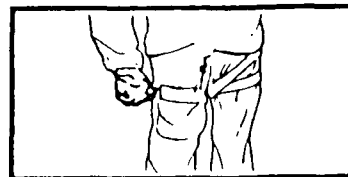
Figure 19-3.—Nerve agent antidote kit (NAAK), MARK I.

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ATROPINE #1

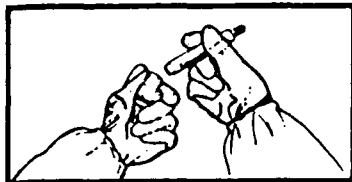


- ① Pull small injector out of plastic holder

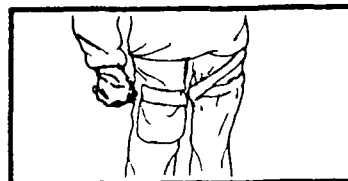


- ② Hold device by labeled part and push green end against outer thigh until you feel the injector function. Hold firmly in place for ten seconds.*

PRALIDOXIME CHLORIDE #2



- ③ Pull large injector out of plastic holder



- ④ Hold device by labeled part and push black end against outer thigh until you feel the injector function. Hold firmly in place for ten seconds.*

*NOTE: Holding the injector firmly in place for ten seconds will be important if a real injection were being given to allow the drug to enter the body.

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Figure 19-4.—Instructions for use of NAAK, MARK I.

WARNING

If, within 5 minutes after the administration of any set of injections, your heart beats very rapidly AND your mouth becomes very dry, DO NOT give yourself another set of injections.

If an individual experiences severe symptoms from nerve agent poisoning and is unable to administer self-aid, a buddy must perform the following aid measures.

1. Mask the casualty.
2. Using the victim's NAAK, administer three sets immediately and in rapid succession in the thigh muscle of the leg.
3. Hook the expended autoinjectors to the casualty's overgarment pocket flap.
4. Administer the back pressure-arm lift method of artificial ventilation if breathing is difficult or has ceased.

5. Seek medical attention as soon as possible.

Continue to perform your duties if you get good relief from the atropine and can breathe freely again. Dryness of the mouth is a good sign. It means that you have had enough atropine to overcome the dangerous effects of the nerve agent.

If you should get a splash of liquid nerve agent in your eyes, instant action is necessary to avoid serious injury. Obtain water as fast as possible, tilt your head back so that your eyes look straight upward, and slowly pour water into the contaminated eyes to flush them out. Hold the eyes open with the fingers, if necessary. Pour the water slowly so that the irrigation will last not less than 30 seconds. This irrigation must be done in spite of the danger of breathing nerve gas vapor. Don your mask quickly after completion of irrigation. Then if the symptoms of nerve gas poisoning develop, give yourself an injection from the NAAK, Mark I.

If liquid nerve gas gets on your skin or clothing, fast action is needed to get rid of it. Immediately use the M258A1 decontamination kit. Then carry on with your combat duties. Meanwhile, watch for any twitching in the muscles under the contaminated area. If no twitching develops in the next half hour, and you have no tightness in your chest, your decontamination was successful and you can forget it.

If twitching of the muscles in the area of the contaminated skin does develop, do not wait for the appearance of other symptoms, but give yourself the injections from the NAAK, Mark I at once. If no other symptoms develop, one series of injections is enough. The atropine does not relieve the local twitching of the muscles, but this twitching is not dangerous.

Avoid water and food that may be contaminated with nerve agents. Let the medical personnel check the food and water for safety before you consume them. If you have swallowed contaminated food or water, and all of the following symptoms occur—increased flow of saliva, nausea, pains in the stomach, and tightness in the chest—give yourself the injections from the NAAK, Mark I.

BLISTER AGENTS.—Casualties of blister agents such as HD (distilled mustard) will exhibit redness and inflammation of the eyes. Usually several hours after exposure, reddening of the skin will appear, followed by the appearance of blisters. There is NO first aid for blister agents other than decontamination. Blister agent effects will be delayed for several hours to days. To decontaminate the eyes, flush with plain water repeatedly. Any blister agents on the skin and clothing should be removed using the M258A1 decontamination kits. Seek medical care as soon as possible. If evacuation to a medical facility is required, blister agent casualties will receive the same treatment given other burn victims.

BLOOD AGENTS.—Agents such as AC and CK enter the body by inhalation and produce symptoms ranging from convulsions to coma. They act on the body by interfering with the ability of oxygen-carrying cells to transfer oxygen to other body tissue. They may have an irritating effect on nasal passages.

There is currently no self-aid or buddy aid treatment for blood agent symptoms. Affected personnel should seek medical attention.

CHOKING AGENTS.—This agent will produce coughing, choking, nausea, and headaches in casualties. Delayed effects include rapid and shallow breathing, painful cough, discomfort, fatigue, and shock. First aid includes immediate masking. This may prevent further damage. No specific first aid other than efforts to prevent shock is available.

VOMITING AGENTS.—For protection against vomiting agents, put on your mask and wear it in spite of coughing, sneezing, salivation, or nausea. If necessary, briefly lift the mask from your face to permit vomiting or to drain saliva from the facepiece. Clear your mask each time you adjust it to your face and before you resume breathing. Carry on with your duties as vigorously as possible; this will help to lessen and to shorten the symptoms. Combat duties can usually be performed in spite of the effects of vomiting agents.

TEAR AGENTS.—If liquid or solid agents have entered your eyes, force your eyes open and flush them with water. Put on your protective mask, cover the outlet valve and voice meter and blow hard to clear the mask. Keep your eyes open as much as possible. When your vision clears, continue to perform your duties. When it is safe to remove your mask, blot away tears, but do not rub your eyes. Now face into the wind.

INCAPACITATING AGENTS.—By the time a victim of incapacitating agent exposure realizes something is wrong, he may be too confused mentally to handle his own decontamination. These cases should be taken to medical personnel immediately. If many people are affected, it may be necessary to confine them temporarily under guard to prevent accidents. These personnel must not be allowed to enter critical or dangerous spaces until complete recovery is achieved, because these victims may not be responsible for their actions. In addition, some of these agents prevent sweating, which increases the danger of heat stroke on hot days.

Personnel Decontamination

Decontamination can be accomplished by the removal, neutralization, absorption, or weathering of the chemical agent. The primary purposes of decontamination are to prevent casualties and to remove obstacles that may prevent mission accomplishment.

Individual decontamination, or self-aid, is performed by the individual, with material on hand, on himself and the equipment he uses. It is performed as soon as practical and is usually sufficient to allow the individual to carry on his assigned mission. The M258A1 is used for limited decontamination of all items of individual clothing and equipment.

Unit decontamination is an organized effort performed by personnel of the unit, with equipment available to the unit, when directed by the commander, and under supervision of trained CBR specialists. All officers and qualified CBR specialists should be prepared to act as supervisors of decontamination teams when required.

Support-Level Equipment Decontamination

Equipment decontamination stations are located as far forward up wind as possible and are normally run by a specialized decontamination team or unit.

BIOLOGICAL DEFENSE

Protective measures against a biological threat include training, immunization of personnel, and strict personal hygiene.

Biological Defense Training

Training for defense against biological agents must stress the necessity for an alert and questioning attitude toward any indication that biological agents may have been used. Although a knowledge of these agents is important, there must be no unreasonable fear of disease from a suspected biological attack. Personnel should be instructed not to repeat or exaggerate rumors.

SEABEES should also know the following facts about a biological attack:

- It is normally impossible to recognize or detect.
- It may be used to supplement other types of attack.
- It may be used to cause either delayed death or incapacitation for strategic purposes.

Prevention of Disease

Casualties from a biological attack can be reduced by using the following preventive measures:

- Strict personal hygiene
- Immunization
- Quarantine of contaminated structures and areas
- Instruction in the proper care of cuts or wounds
- Using only approved sources of food and drink

High standards of personal hygiene and, when practical, avoidance of practices that produce a run-down condition will assist personnel in fighting an infection. The importance of good protective mask discipline and proper field sanitation measures must be emphasized.

Indications of a Biological Attack

These are indications of a biological attack.

- Low-flying aircraft that appear to be producing a mist or spray
- The function of any type of spray device
- The function of a submunition, such as a bomblet, that appears to have no immediate effect

- Unusual types of bomblets found in the area

- Swarm of insects, such as mosquitoes, suddenly appearing after aircraft have dropped containers that did not appear to have any immediate effects

Defensive Measures After a Biological Attack

Units are not equipped with devices to indicate a biological hazard. After a suspected biological attack, individuals must continue wearing their protective masks until authorized to remove them by competent authority.

DECONTAMINATION OF PERSONNEL.—After a suspected biological warfare attack, individuals can decontaminate themselves by showering with soap and hot water. The fingernails and toenails should be thoroughly cleaned and the hairy parts of the body should be thoroughly scrubbed. Contaminated clothing must be washed in hot soapy water if it cannot be sent to a field laundry for decontamination. Cotton items may be boiled.

DECONTAMINATION OF OUTDOOR AREAS.—Sunlight kills most microorganisms and will usually decontaminate unshaded outdoor areas. However, shaded areas may remain hazardous from several hours to several days. Decontamination of a large area is not feasible.

DECONTAMINATION OF INDOOR AREAS.—Personnel in a shelter or building that is suspected of being contaminated with biological agents should wear their protective masks until they leave the building.

GUARDING AGAINST CONTAMINATION.—All exposed surfaces must be assumed to be contaminated. Sealed containers, such as bottles and cans containing food and water, should be washed down and boiled before opening.

REPORT SICKNESS PROMPTLY.—Prompt reporting of sickness serves two major purposes.

1. It gives medical personnel the opportunity to try to identify the biological agent to which the individuals were exposed. Once the disease has been identified, effective medical measures can be taken.

2. It helps to prevent the spread of disease from man to man.

TREATMENT OF CASUALTIES.—There are no self-aid measures for the diseases that are caused by agents. In comparison to measles, the symptoms of biological warfare diseases appear in a like manner. Although it may be a matter of days before it can be determined what types of biological warfare agents are present, medical personnel will direct the decontamination of these casualties.

Even though the Navy provides preventive shots for some diseases, additional shots have been developed, which will be given to all hands if biological warfare ever occurs. If you should contract a disease from biological warfare in spite of the shots, the sickness should be mild, and medical personnel will ensure that you receive the best treatment available.

NUCLEAR DEFENSE

On a nuclear battlefield, units must be dispersed to the greatest extent possible consistent with the situation and the mission. Dispersed units present smaller targets and, hence, are less vulnerable. In contingency planning, the positioning, movement, and missions of units may require adjustment by the commanders to minimize the effects of nuclear bursts while maintaining the ability to continue construction operations and hold defensive positions. Defensive measures for individuals and units should include protection from blast, heat, and initial and residual radioactive fallout.

Defensive Measures Before a Nuclear Attack

When a nuclear attack is imminent, the best defense is to dig in. Earth is one of the best

shielding materials available in the field. SEABEE defensive positions, which will vary from individual fighting holes to improved defensive positions, should be prepared whenever the tactical situation permits. Read chapter 9 for detailed information on constructing fighting holes and shelters.

FIGHTING HOLE.—A properly constructed fighting hole will provide excellent protection against initial radiation. The deeper the fighting hole, the more protection it will provide. An overhead covering of earth or other material will help reduce the amount of thermal and initial nuclear radiation and fallout material from reaching the individual. However, this cover must be sturdily constructed to withstand the blast wave.

FIELD SHELTERS.—Tunnels, caves, and storm drains provide effective shelter. Culverts and ditches can be used in an emergency, although they offer only partial protection. Vehicles made of steel, such as tank and armored personnel carriers, will provide some protection. Buildings usually are not strong enough to provide effective shelter, but the middle floors or basement of a reinforced concrete or steel-framed building will offer good protection from all effects except the blast. Personnel should avoid the areas around windows and other openings.

SUPPLIES AND EQUIPMENT.—Individual equipment and supplies not being worn should be placed in the fighting hole. None of this equipment can be left unsecured because the blast wave will convert them into lethal missiles. Unit supplies, particularly explosives and flammables, should be dispersed within the unit area and protected or shielded. Debris must be kept to a minimum and not be allowed to collect where a fire hazard could be created. Objects such as radios, generator tools, and gas cans must always be secured to minimize the danger of flying debris caused by the blast wave.

Defensive Measures During a Nuclear Attack

A nuclear attack will probably come without warning. The first indication will be an intense

light. Heat and initial nuclear radiation come with the light and the blast follows. There will be little time to take protective measures since the blast wave travels at the speed of sound (about 1,000 feet per second). Individual defensive actions must be automatic and instinctive. Unit activities will be suspended for a short period while all personnel take cover. If the possibility exists of a surprise nuclear attack, all personnel not engaged in essential activities should remain under cover as much of the time as possible. Individuals who are exposed when a nuclear detonation occurs should do the following:

- Immediately drop flat on the ground (face down) or to the bottom of a fighting hole.
- Close your eyes.
- Protect exposed skin from heat by putting hands and arms near or under the body. Keep helmets on.
- Remain down until after the blast has passed and debris has stopped falling.
- Stay calm, check for injury, check weapons and equipment for damage, and prepare to continue the mission.

Defensive Measures After a Nuclear Attack

Following a nuclear attack, designated individuals should begin fallout monitoring so that fallout arriving in the unit area will be quickly detected. When warned of the arrival of fallout, and the tactical situation permits, individuals should take cover and remain protected until instructed otherwise.

A handkerchief or similar cloth can be worn over the nose and mouth. If dust particles make breathing difficult or cause discomfort, the protective masks will not be used as a dust respirator. If it is necessary to remain in an area having fallout, individuals should dig in quickly, sweep fallout particles away from the area around fighting holes, and remain covered until fallout stops.

The skin and clothing of individuals who have been exposed to fallout or who have traveled

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through a radiologically contaminated area may be contaminated to a level that may cause a skin rash. If the situation prohibits complete decontamination, then field-expedient methods should be used to reduce the radiation hazard. Some of these methods that remove alpha and beta emitting particles include the following:

- Removal and vigorous shaking of clothing or brushing the clothing with brushes (avoid breathing dust)
- Removing dust from the hair and from under the fingernails
- Wiping exposed skin with a damp cloth

All personnel should bathe and change clothing as soon as the tactical situation permits. Remember that runoff water will be contaminated, and appropriate defensive measures should be taken.

The requirement for decontamination of individual equipment, vehicles, weapons, and ammunition can be reduced, if, before fallout arrives, they are covered with materials such as tarpaulins, shelter halves, or ponchos. An effective way to remove radiological contamination is to wash it with water.

Contamination Avoidance

Contamination avoidance can help minimize exposure by doing the following:

- Limiting the duration of exposure through reduction of time stayed in the hazard area
- Delaying entry time until radiation decays sufficiently to permit safe passage or occupancy of both
- Avoiding and bypassing of contaminated areas

First Aid Treatment

The casualty-producing effects of a nuclear explosion are blast, heat, and nuclear radiation. First aid measures are limited to those for burns caused by thermal radiation and injuries caused

by the blast. There are no immediate lifesaving measures for the treatment of radiation sickness or blindness caused by the intense light.

If the tactical situation does not permit you to go to a decontamination station, you must be able to remove most of the radioactive material with whatever you have on hand. If you become heavily contaminated, the following measures are recommended:

1. You must remove your outer garments. Shake them vigorously or brush them off. Be sure that the clothing is held downwind. This will remove most of the radioactive material unless it is wet and muddy.
2. If it is too cold or wet to remove your outer clothing, brush or scrape them carefully.
3. The same procedure should be used to decontaminate your equipment.

Personnel Decontamination Station

Complete personnel decontamination is conducted at a personnel decontamination station (PDS). The PDS is set up in a secure, uncontaminated area, located as far forward as the tactical situation permits. Personnel from both the decontamination and the supported unit operate the PDS under the supervision of the Chemical, Biological, and Radiological Defense Officer (CBRDO) NOBC 2765 or the Disaster Preparedness Operations and Training Specialist, NEC 9598.

SEABEE CBR DEFENSE EQUIPMENT

NOTE: The following information was current when it was written. Because of the frequency of change in CBR defense equipment, consult the Disaster Preparedness School (NCTC, Gulfport, Mississippi, or Port Hueneme, California) nearest you for the latest information.

SEABEE CBR defense equipment consists of permeable protective clothing, protective footwear covers, protective masks, skin decontamination kits, and atropine.

CBR Permeable Protective Clothing

This two-piece overgarment consists of one coat and one pair of trousers. It is packaged in a sealed vapor barrier bag to provide protection while not in use against rain, moisture, and sunlight. Refer to the bag for detailed instructions for using the protective clothing. The coat and trousers are made of material having an outer layer of nylon and cotton and an inner layer of charcoal-impregnated polyurethane foam that gives protection against vapors, aerosols, and small droplets of nerve and blister agents. The overgarment is intended to be worn over the duty uniform; however, in high temperatures, it may be worn directly over the underwear. The overgarment is not designed to be decontaminated and reimpregnated for reuse. It is discarded within 6 hours after being contaminated with liquid chemical agents or when it becomes worn or ripped to the extent that it cannot be repaired with the individual issue patch accessory. The garment is to be discarded after 14 days of wear.

Chemical Protective Footwear Covers (Overboots)

Overboots (fig. 19-5) are worn over standard combat boots. They protect the feet from



Figure 19-5.—Chemical protective footwear covers (overboots).

contamination by all known chemical agents, vectors, and radiological dust particles.

The overboots are impermeable and have unsupported butyl-rubber soles and butyl sheet-rubber uppers. When insulated boots (cold weather "Mickey Mouse" boots) are worn with the overgarment, the overboots are not necessary. The insulated boots provide adequate protection in a chemical environment.

CBR Field Protective Masks

These masks, when properly fitted and worn with the hood, give protection against field concentrations of all known enemy chemical agents in vapor or aerosol form. They do so by filtering contaminated air to remove the agents, not by producing oxygen. When the air has a low oxygen content or when individuals are in tunnels or caves with a heavy concentration of aerosolized particles, such as burning smoke mixtures, the protective mask will not provide breathable air. These masks also do not protect against ammonia vapors or carbon monoxide.

The M17A1 mask is the standard field protective mask. The following are components of the M17 series mask.

1. Face Blank Assembly
2. Carrier (M15)
3. M1 Waterproof Bag
4. Eye Lens Outserts
5. M1 Canteen Cap (with M17A1 mask only)

The following are accessories for the mask.

1. M6A2 Hood
2. Optical Inserts
3. M4 Winterization Kit

The M17A1 mask has matched pair filter elements (one for the right side and one for the left side of the mask) that are designed for protection against normal field concentrations of all known toxic chemical agents and are considered adequate for all foreseeable field use. Both filters must be replaced carefully under the following circumstances: when directed by higher headquarters; after prolonged usage; once every 30 days after initiation of chemical warfare; if they impose severe impedence to breathing; after

immersion in water; on visual examination, if they are found to be damaged or unserviceable; or if the lot numbers do not match.

Skin Decontaminating Kit M258A1

An M258A1 will be issued to each individual during operations in a toxic chemical environment. It will decontaminate both nerve and blister agents. Use of this kit was discussed earlier in this chapter. The kit contains three towelettes of each type (a total of six). Each pad is sealed in tear-away impermeable foil packets. A single M258A1 kit contains materials to allow the individual three complete decontaminations.

NAAK, Mark I

Three NAAK, Mark I injectors are carried by the individual in the top outside pocket of the mask carrier. These injectors are used for nerve agent first aid. This solution has a relatively high freezing point and should be removed from the carrier and placed inside the field uniform in cold weather (below 45 °F).

CBR UNIT EQUIPMENT

Each SEABEE unit should have the equipment discussed below.

Automatic Chemical Agent Alarm

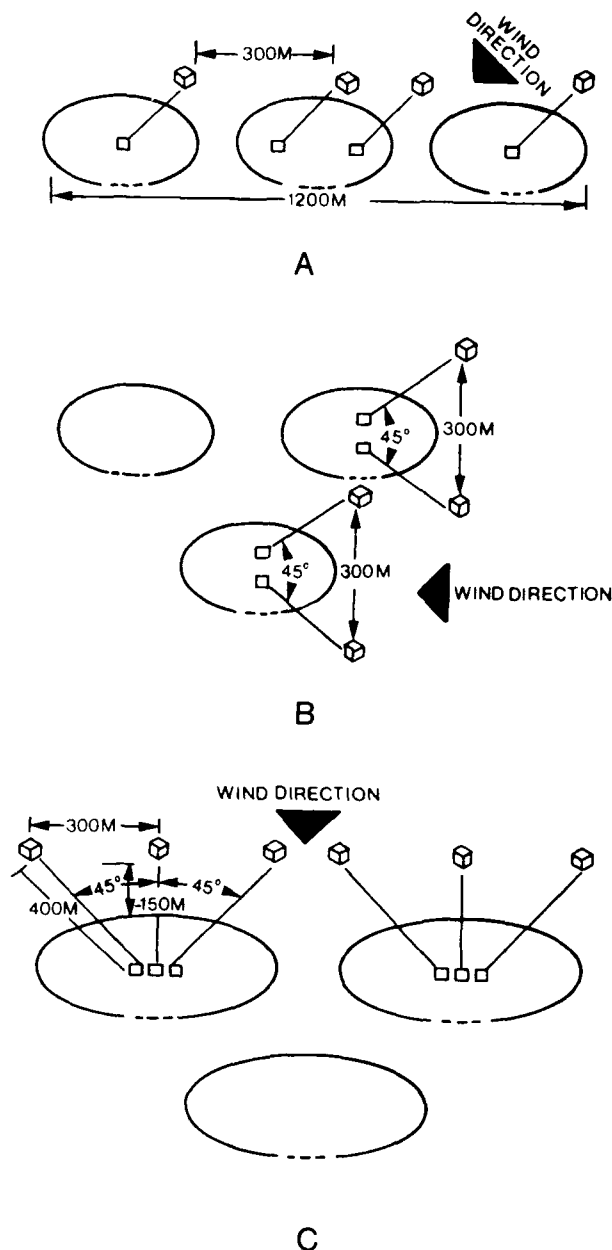
The automatic chemical agent alarm will be the primary means of detecting chemical agents arriving in a unit area from an upwind chemical attack. It can detect chemical agents in vapor and aerosol form and can alert personnel by audible and visual signals. It is issued to platoons, companies, and similar units.

The M43 detector unit of the automatic chemical agent alarm continuously samples the air at its location and indicates the presence of nerve agents. The M43 gives an audible alarm. The M42 remote alarm unit provides both an audible and visual alarm when connected by wire to the M43 detector. The M42 audible alarm can be manually turned off. Up to six M42s can be connected at a maximum of 400 meters to the M43.

Figure 19-6, view A, illustrates a situation where four detectors are emplaced with three platoons on line. Note the orientation on the wind direction. The detector is oriented on wind direction, not on the direction of the enemy. When the automatic chemical agent alarms are

mounted on vehicles, consideration must be given to wind direction for the protection of the main body.

Figure 19-6, view B, shows an array using four detectors with the wind direction coming from the right flank of the unit. A significant difference



187.224

Figure 19-6.—Deployment of automatic chemical agent alarms.

between a four-detector array and a six-detector array is that with only four detectors the array must be shifted when the wind direction shifts greater than 20 degrees. Also shown is another point which is often overlooked in chemical warfare defenses: the detector is oriented on wind direction, not on the direction of the enemy.

Figure 19-6, view C, shows a company in defensive position with six detectors deployed. The actual number of alarm systems per unit will vary depending upon the Table of Allowance (TOA). The 300-meter distance between the M43 detectors reduces the possibility that agent clouds might drift through holes in the array. This array provides a high probability of detecting an off-target attack within a reasonable warning time.

REMEMBER: THE DETECTOR IS ORIENTED ON WIND DIRECTION, NOT ON THE DIRECTION OF THE ENEMY.

IM-143/PD or IM-143A/PD Dosimeter

This is the standard tactical dosimeter in use today. It is a direct reading instrument capable of detecting and recording a total dose of up to

600 rads. It is termed a "pocket" dosimeter and is about the size and shape of a fountain pen.

AN/PDR-27 Radiac Set

It contains a low range dose rate Geiger-Mueller type of instrument used for monitoring contamination of personnel, food, and equipment. It measures gamma and detects beta radiation.

Portable Decontaminating Apparatus (PDA) ABCM11

The M11 works on the same principle as a fire extinguisher. The bottle is filled with DS-2 and is put under pressure through utilization of a nitrogen cylinder. It holds only 1 1/3 quarts of DS-2, so it is useful for decontaminating only small surface areas on the vehicle.

MISSION-ORIENTED PROTECTIVE POSTURE

Mission-oriented protective posture (MOPP) is a flexible system of protection against chemical agents used to facilitate mission accomplishment in chemical warfare. MOPP requires the individual to wear protective equipment consistent with the chemical threat, the work rate imposed by the mission, and the temperature. See table 19-1 for MOPP levels.

Table 19-1.—MOPP Levels Before Chemical Attack

MOPP LEVEL	OVERGARMENT	OVERBOOTS	MASK WITH HOOD	GLOVES
1	WORN, OPEN OR CLOSED BASED ON TEMPERATURE	CARRIED	CARRIED	CARRIED
2	SAME AS MOPP-1	WORN	CARRIED	CARRIED
3	SAME AS MOPP-1	WORN	WORN, HOOD OPEN OR CLOSED BASED ON TEMP	CARRIED
4	WORN, CLOSED	WORN	WORN, HOOD CLOSED	WORN

All combat operations are conducted under the mission-oriented protective posture system. Of course, if there is no threat, then there is no protection requirement, but this is still a MOPP. At the other extreme, when there is a continuing, immediate threat of chemical attack and the enemy has a capability to produce an unacceptable casualty level among unprotected troops, the troops may be required to wear protective clothing and equipment for extended periods. In this case, some form of safe area must be provided so that troops can perform necessary functions that require the removal of some or all of the protective gear.

MOPP FLEXIBILITY-LIMITING FACTORS

The flexibility of MOPP in providing individual protection is limited by the temperature of the surrounding area, fatigue level of the troops, the degree to which the troops need to use their senses, and personal needs.

Heat Exhaustion

Individuals operating a moderate to heavy work rate while in chemical protective gear may experience heat exhaustion (dizziness and fainting) at any time, especially during periods of high temperature.

Fatigue

Individuals in full chemical protective clothing and equipment will tend to experience fatigue resulting from such factors as mask breathing resistance, increase in body temperature from work energy and solar heat, and psychological and physiological stress. This condition of fatigue increases the need for rest and sleep to maintain individual alertness and efficiency.

Senses

Individuals who are required to perform duties involving their senses or related functions such as manual dexterity, visual activity, and voice communication will operate at varying decreased levels of efficiency, depending on training and proficiency, while in full protective gear.

Personal Needs

Individuals cannot be in full chemical protection for indefinite periods and still attend to certain personal needs such as eating, caring for wounds, shaving, and eliminating of body wastes.

STAFF CONSIDERATIONS FOR MOPP

The staff will be required to give recommendations to the commander as to the appropriate MOPP for a particular mission. The commander's general guidance for the use of protective clothing and equipment should be stated in the standard operating procedure (SOP). The SOP should also define the levels of MOPP in detail as they will be used in that unit and what items of protective equipment are required for each level and how they are to be used. When he gives his planning guidance for a particular mission, the commander may specify variations on the MOPP levels. Any variations from the SOP are published in the coordinating instructions of operations, orders, and plans.

The staff evaluation of the unit's possible courses of action to accomplish the mission must consider the commander's guidance and required levels of protection, acceptable numbers of casualties from chemical agents, heat buildup, and conventional munitions in determining what MOPP to recommend.

The staff must evaluate the type of mission and its relative importance to the overall operation. When this mission is analyzed in relation to chemical protection, the following questions must be answered before a MOPP is established:

1. What work rate does the mission involve?
2. What will the temperature be during the mission?
3. Can the mission given to subordinates be changed or modified to achieve similar results with an increase in protection and a decrease in risk?

The staff must also evaluate the chemical threat. Part of the threat is the capability of the enemy to use chemical agents and the probability that they will do so. Information on this capability and probability may be provided through

intelligence channels or may be based on previous experience. It also encompasses the capability of a unit to survive in a chemical environment.

The staff must decide if the chemical threat could prevent the accomplishment of the mission, cause temporary modification of the mission, or cause the commander to accept the possibility of more heat casualties. To prevent excessive casualties from chemical protection, he must accept the risk of increased numbers of chemical casualties. The number and severity of these casualties will depend on the alertness of the troops, the adequacy of the warning and alarm system, the elapsed time between the attack and subsequent personal decontamination, and the adequacy of first aid treatment.

Reduced chemical protection of troops should not be permitted unnecessarily because of the risk of heat stress or even exhaustion. Normally heat causes only a brief illness, whereas chemical casualties can cause more serious long-term effects. Usually, victims of heat exhaustion recover within a few hours. Heat stroke casualties will not recover within a few hours—some will never recover and others will require prolonged medical care. The command can greatly reduce heat exhaustion of personnel by emphasizing the importance of maintaining excellent physical fitness and drinking enough water.

The schedule of completion for a mission must be carefully studied because the time needed to perform most tasks will increase when troops are required to wear full protective gear. This fact must be accepted and included in the planning.

The staff should consider the effects of environmental factors such as temperature and wind speed. Temperature directly affects body heat buildup, especially when you are wearing protective clothing. This buildup, in turn, directly affects the unit's ability to accomplish its mission. High temperature severely curtails the MOPP options.

Wind speed has an effect in that high winds decrease the probability that the enemy will use chemical agents and thus allows the commander the opportunity of designating a lower MOPP level. Winds also aid in the dissipation of body heat when troops clad in protective garb are able to open or partially remove their protective clothing.

THE PHYSICAL NEEDS OF THE INDIVIDUAL

In using the MOPP system, the commander and staff must also consider the physical needs of the troops, such as eating, drinking, sleeping, eliminating body wastes, bathing, shaving, and changing clothes. The wearing of protective clothing and equipment creates unique problems in these areas.

Feeding

The feeding of personnel in a chemical environment depends primarily on the type and extent of the contamination. Some of the available options are listed below.

1. If the unit is in a contaminated area where there is also a vapor hazard, feeding must be done inside some sort of collective protection.

2. If the unit is located in a heavily contaminated area and no collective protection is available, it may be necessary to withdraw troops to a nearby safe area or to a rear area for feeding. This could be done on a rotational basis but could also be done by a unit replacement system. The method used would be highly dependent on the situation, the distance involved, and the availability of an uncontaminated area.

3. Feeding can be done in the open on a rotational basis allowing about 25 percent of the unit to unmask at one time if the unit is located in a contaminated area but there is no detectable vapor hazard, or the unit is in an uncontaminated area but under constant threat of chemical attack.

In all these situations, take care to ensure that the food is not contaminated with chemical agents.

Drinking Water

Troops equipped with M17A1 protective masks use the drinking device while in a contaminated area. Normally, drinking from and refilling the canteen in an area contaminated with a chemical agent that does not present a vapor hazard can be done with only minor decontamination of the canteen cap and the water spigot areas.

In more hazardous areas, the commander must make arrangements for the delivery of filled canteens with the caps on in exchange for empty ones that are collected in the contaminated area. The empties must then be decontaminated thoroughly before refilling.

Sleeping

Personnel should sleep in full chemical protection and under cover whenever possible.

Personnel Identification

The wearing of chemical protective clothing and equipment makes normal identification of personnel very difficult. Each unit should devise an expedient method of making identification easier. One such method is the wearing of color-coded tape for the men of each platoon of a company.

Defecating and Urinating

A decontaminated area should be provided, if possible, for troops to use for the elimination of body wastes and removal of contaminated protective clothing to prevent contamination of underclothing or exposed skin.

Shaving, Bathing, and Changing Clothes

When operating for extended periods in a contaminated environment, personnel must be provided with means of shaving, bathing, and changing clothes. A close shave is necessary to ensure a good seal for the protective mask.

PROTECTIVE CLOTHING AND EQUIPMENT-TEMPERATURE GUIDELINES

In areas where SEABEES must wear the chemical protective clothing ensemble, the temperature must be considered when determining the MOPP level. This consideration is essential if the troops are to continue to perform their mission task effectively. See the note for table 19-2 for examples of the work rate levels.

In Cool Temperatures (10° to 21°C or 50° to 70°F)

Unless involved in heavy work, troops should be able to continue to function without significant degradation from heat buildup while wearing full protective gear. As the work rate increases, troops should be able to continue their mission if they are permitted to rest for longer periods to allow for the dissipation of built-up body heat.

In Warm Temperatures (21° to 29°C or 70° to 85°F)

When involved in moderate work and not in a contaminated area, troops should be able to continue their mission if they are permitted to modify their chemical protection by removing the mask, hood, gloves, and partially opening the clothing. If troops are in a contaminated area, the periods of moderate to heavy work must be significantly reduced if heat casualties are to be kept to a minimum.

In Hot Temperatures (29° to 38°C or 85° to 100°F)

When involved in moderate or heavy work and not in a contaminated environment, troops can

be expected to continue their mission only if they are permitted to reduce their chemical protection to a very low level. Unfortunately, the potential for heavy chemical casualties if the unit comes under chemical attack without warning is great.

Sustained, Moderate Effort Tasks

Sustained, moderate efforts, such as road marches, can be much more taxing and can produce more heat casualties among troops in protective clothing than short-duration, high-energy tasks. The relationship between level of effort and time and effort is, therefore, also a factor of consideration.

OPTIONS IN DETERMINING THE MOPP LEVEL

Based on the recommendations of his staff and his analysis of the situation, the commander must determine what level of chemical protection is appropriate so that his unit can accomplish its mission in a chemical environment.

Whenever possible, the commander should specify, before the start of a mission, the MOPP level that individuals will adopt. He may later direct that this level of protection be increased, decreased, or varied among individuals or elements within the unit according to his evaluation of the current situation and operational limitations.

Table 19-2.—Example Variations of MOPP

TEMPERATURE RANGE			
Work Rate ¹	(50° – 70°F) 10° – 21°C	(70° – 85°F) 21° – 29°C	(85° – 100°F) 29° – 38°C
LOW	Wear full protective clothing and equipment.	Progressively open hood and clothing.	Remove and carry mask, hood, and gloves. Remove some protective clothing.
MODERATE	Wear full protective clothing and equipment.	Remove and carry mask, hood, and gloves. Open protective clothing and duty uniform.	Remove and carry mask, hood, and gloves. Remove some protective clothing.
HEAVY	Remove and carry mask, hood, and gloves. Progressively open and remove some protective clothing.	Remove and carry mask, hood, and gloves. Remove some protective clothing.	Remove and carry mask, hood, and gloves. Remove some protective clothing.
NOTE 1: EXAMPLES OF WORK RATES:			
1. LOW - Motorized movement or administrative work.			
2. MODERATE - Improvement of positions or reserve position activity.			
3. HEAVY Infantry dismounted assault or forced march.			

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Table 19-3.—Cyclic Work/Rest Values (Minutes) With Negligible Heat Casualties

MOPP* Level	Work Rate	Temperature Ranges‡			
		(70°F) 21°C	(70° – 79°F) 21° – 26°C	(80° – 89°F) 27° – 32°C	(90°F +) 33°C
1	Low	†	†	†	†
	Moderate	†	†	60/20	40/50
	Heavy	†	60/15	40/25	30/50
2	Low	†	†	†	50/50
	Moderate	†	†	50/35	30/60
	Heavy	60/30	45/30	25/30	§
3	Low	†	†	†	60/30
	Moderate	†	60/20	40/35	30/50
	Heavy	40/20	35/30	§	§
4	Low	†	†	40/30	20/50
	Moderate	40/20	30/25	20/40	§
	Heavy	20/25	§	§	§

Warning: This table is intended as a guide only. The work/rest values given may be adjusted up or down based on experience in the field by the commander.

* MOPP levels are based on the protective clothing and equipment worn.

1. Fatigues with protective mask only.
2. Fatigues with protective mask, hood, gloves, and body armor.
3. Overgarment over fatigues or fatigues over protective liner.
4. Level 3 with addition of mask, hood, gloves, and body armor.

† Under these conditions, any reasonable work/rest periods will suffice to prevent heat casualties.

§ Under these conditions, work time will be severely limited and even short periods of heavy work could result in heat casualties.

‡ Well-trained (acclimated) troops will require shorter and less frequent rest periods than poorly trained troops.

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The commander may also authorize longer and more frequent rest periods. See table 19-3 for guidance on suggested work times and rest periods for personnel dressed in chemical protective clothing and equipment. The rest periods, shown in minutes, are those necessary to allow sufficient cooling time for the dissipation of built-up body heat. The work/rest values are cyclic; that is, the periods may be repeated as many times as necessary to complete a job.

The command should also provide an adequate water supply so personnel can increase their water intake by frequent drinking of small amounts. Personnel should use vehicular transportation whenever possible.

When no immediate hazard from chemical agents exists, a commander may rotate personnel to various combinations of reduced chemical protection to provide relief from the build-up of the body heat. The commander may also allow a small percentage of his troops to be out of their chemical protective clothing at one time. The number of personnel in reduced protection is determined by the unit commander according to his evaluation of the location situation.

Reduced protection also is permitted on a selective basis for personnel performing certain tasks requiring manual dexterity, good vision, and voice communication.

In addition, in a contaminated area, the commander must consider the following options:

1. Rotate jobs requiring a heavy work rate among subordinate units, elements, or individuals.

2. Reduced protection may also be necessary after the commander considers the long-term psychological effects on personnel in full chemical protective clothing and equipment for extended periods.

3. If the troops are required to operate at moderate to heavy work rates and there is no danger from chemical contamination (verified by the use of the unit's chemical agent detector kits), the commander may authorize them to progressively reduce their protection by taking the actions listed below.

- a. Open the zipper of the hood (and possibly rolling it up) for ventilation.

- b. Remove the protective gloves.

- c. Remove the protective mask and hood.

- d. Open the duty uniform or the chemical protective clothing for ventilation. This will require loosening or removal of external load-bearing equipment.

- e. Remove some or all of the protective clothing.

Finally, the command has the option of increasing the work times significantly when a job requires a sustained effort for proper accomplishment or is of an emergency nature. Table 19-4 gives guidance for maximum allowable work times under varying conditions. Note, however, that troops who are worked for a maximum period from this table will then require an extended rest (as much as 2 hours or more) to dissipate the built-up heat.

TRAINING

Mission accomplishment in a CBR environment is dependent on two basic requirements.

1. The individual SEABEE must have been trained to take those actions necessary to ensure survival during a CBR attack.

2. Units must be trained to perform their assigned missions in a prolonged CBR environment.

To fulfill these basic requirements, CBR training needs to be integrated into all facets of individual and unit training. Sufficient training time must be allocated to ensure that actions required for initial survival and subsequent mission accomplishment are conditioned responses.

SEABEE commanders will ensure that required training in CBR defense measures is conducted to enable their forces to operate in a CBR environment. General readiness requirements are listed below.

1. Ensure that units attain and maintain established standards of individual and unit CBR defense readiness.

2. Include CBR defense plans in the operation plans.

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Table 19-4.—Maximum Times (Minutes) With Minimum Heat Casualties

MOPP Level	Work Rate	Temperature Ranges			
		(70°) 21°C	(70° – 79°F) 21° – 26°C	(80° – 89°F) 27° – 32°C	(90°F) 33°C
1	Low	XX	XX	XX	XX
	Moderate	XX	XX	XX	100
	Heavy	XX	XX	110	50
2	Low	XX	XX	XX	XX
	Moderate	XX	XX	XX	65
	Heavy	XX	170	65	45
3	Low	XX	XX	XX	XX
	Moderate	XX	XX	140	55
	Heavy	200	95	55	40
4	Low	XX	XX	XX	80
	Moderate	XX	115	65	40
	Heavy	60	50	40	30

Warning: This table is intended as a guide only. Maximum work times may be adjusted up or down based on field experience.

XX: Under these conditions, fatigue caused by exertion will probably be the limiting consideration rather than body heat buildup.

Well-trained (acclimated) troops will require shorter and less frequent rest periods than poorly trained troops.

3. Organize CBR defense capabilities, with necessary personnel and equipment, down to company level.

4. Ensure training of everyone in individual protective measures.

CBR training is a command responsibility and will be no better than the emphasis placed on it

by the unit commander. The addition of a CBR specialist to a unit will not, per se, bring the CBR standards to the desired proficiency level unless the training program is actively supported by the unit commander. Both individual and unit training must be conducted. FM 21-48 is the handbook on individual and unit training procedures in CBR defense at battalion and lower unit level. It contains training exercises required

for survival under a CBR attack. Also included in this manual are principles, procedures, and examples for integrating CBR training into all phases and most types of training; information training materials; training tests to determine individual and unit proficiency in CBR; a performance test on chemical agent detection and radiological monitoring and survey for the unit CBR teams; and guidance for planning CBR play in tactical exercises.

GUIDELINES FOR CONDUCTING CBR DEFENSE TRAINING

The conducting of unit CBR defense training will vary considerably because of local conditions. However, certain basic principles will hold true regardless of the type of unit or its location.

Instruction in CBR defense should include the fundamental principles needed to survive and to continue the mission in a CBR environment. Avoid spending a lot of time teaching nice-to-know technical information. Be practical.

Apply sound training principles. Evidence indicates that often there is a tremendous gap in what *should be* done in military training and what is practiced in the field of CBR defense training. Effective training in CBR will be realized only if the principles of good military instruction are followed.

There is little learning without some physical activity on the part of the trainee. Although it is possible to learn the principles of CBR defense operations by listening to lectures, viewing films, and watching demonstrations, the best way to learn is by *actual participation*. Therefore, the individual must be provided with as many firsthand experiences as possible. He should be required to perform actual protective measures against toxic agents, not merely be exposed to information on procedures. Of particular importance is familiarity with donning protective clothing and equipment.

Training situations should resemble as closely as possible those which can reasonably be expected to be encountered in the performance of combat missions. For example, a CBR attack in combat will probably occur without warning along with other attacks. Therefore, training should be conducted to prepare troops to react properly to a surprise CBR attack.

In gaining realism, the use of simulants can be of great value. The guiding factor in the employment of simulants is that they should be used for definite training purposes.

Use concurrent training. Concurrent training is defined as simultaneous but separate training of part of a unit in one or more subjects other than the primary subject; these subjects may not have been taught previously.

1. An example might include instruction in decontamination for that portion of a unit not on the firing line during annual arms qualification.

2. Concurrent training can also be effectively used to introduce CBR subjects to trainees. If used properly, it can supply additional training time for CBR defense training, as well as for other training, and prevents delays and unoccupied periods in the training program.

Use integrated training. Integrated training is defined as training in which one or more subjects, previously taught and related to the primary subject, are incorporated into the instruction being given to an entire unit.

REASONS FOR INTEGRATED CBR TRAINING

CBR warfare is only one aspect of the overall battlefield situation. Since CBR operations are not a separate form of warfare, but just another factor to be considered along with other methods of waging war, CBR defense operations should be included in other types of training whenever possible.

Integrated CBR training instills confidence. While it is necessary for the individual to have a wholesome respect for CBR agents, he must have confidence in his protective equipment and confidence in his ability to meet CBR attacks successfully. This confidence can be instilled best through proper training.

MARKING OF CONTAMINATED AREAS (STANAG 2002)

The markers, or signs, are used in areas containing radiological, biological, and chemical

contamination. The colorings and markings of the signs are in accordance with STANAG 2002 and are illustrated in figure 19-7. The base of the triangle should be about 11 inches (28 cm) and the opposite sides about 8 inches (20 cm). The signs are in the shape of a right isosceles triangle (90 degrees by 45 degrees by 45 degrees) and are made of plastic, wood, metal, or other rigid material, with holes or "ears" that are used for hanging them about the ground. They are placed on wire boundary fences, poles, trees, or rocks.

CHEMICAL CONTAMINATION MARKERS

The triangle is yellow on both sides. The word "GAS" in red 2-inch (5 cm) block letters is placed

on the side of the markers facing away from the contamination (front). Fluorescent paint is used, if available. The name of the agent, if known, and the date and time of detection are also placed on the front of the marker at the time of emplacement with paint, marking pencil, or grease pencil.

BIOLOGICAL CONTAMINATION MARKERS

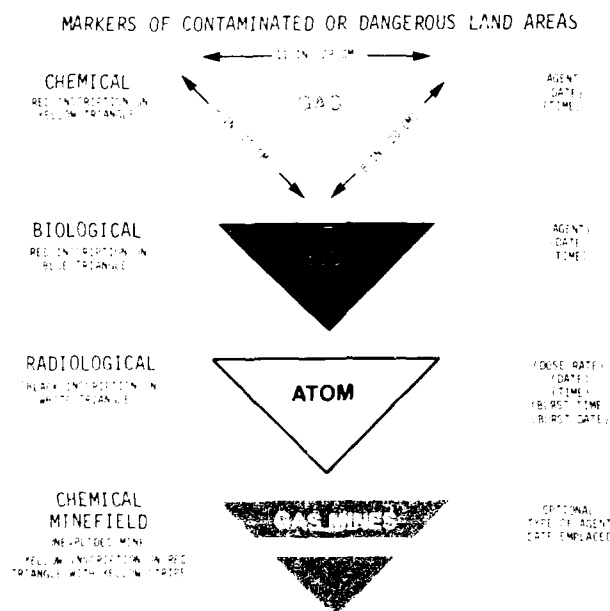
The triangle is blue on both sides. The letters "BIO" in red (fluorescent paint, if available) 2-inch (5 cm) block letters are placed on the side of the marker facing away from the contamination (front). The name of the agent, if known, and the date and time of detection are also placed on the front of the marker at the time of emplacement.

RADIOLOGICAL CONTAMINATION MARKERS

The triangle is white on both sides. The word "ATOM" in black 2-inch (5 cm) block letters is placed on the side of the markers facing away from the contamination (front). The dose rate, date, and time of reading, and the date and time of burst, if known, are also placed on the front of the marker at the time of emplacement.

CHEMICAL MINEFIELD MARKERS

The triangle is red on both sides. On the side facing away from the contamination (front) appear the words "GAS MINES" in yellow 1-inch (2.5 cm) block letters (fluorescent paint if available) with a horizontal yellow 1-inch (2.5 cm) stripe underneath the lettering. The chemical agent in the mines and the date of emplacement may also be inscribed on the front of the marker if desired by the commander.



C3.178

Figure 19-7.—CBR contamination markers.

APPENDIX I

GLOSSARY OF COMMON MILITARY TERMS

ADDRESSEE.—The activity or individual to whom a message is to be delivered.

ADJUST.—A command to the spotter or observer to initiate an adjustment on a designated target.

ADJUSTMENT.—Process used to obtain correct line, range, and correct height of burst (if time fuzes are used) in engaging a target by observed fire.

ADMINISTRATIVE PLAN OR ORDER.—A combat plan or order relating to the operation plan or order for a tactical operation, which is issued as its paragraph 4. It sets forth information and instructions governing the logistical and administrative support of the operation.

ADVANCE.—The forward movement of a unit toward the enemy.

ADVANCE BY BOUNDS.—An advance controlled by the assignment of successive objectives, usually from one terrain feature to the next.

ADVANCE BY ECHELON.—An advance of a unit by successive movement of its component elements.

ADVANCE GUARD.—A security element that precedes and protects the main body of a force, whatever its formation, and covers its deployment for action if enemy contact is made.

ADVANCE PARTY.—A security element organic to the advance guard that precedes and protects the support.

ALIGNMENT.—The formation in a straight line of several elements.

ALTERNATE POSITION.—The position designated to serve as the primary position under certain conditions.

AMPLIFIER: A device that increases signal power.

ANGLE OF ELEVATION.—The vertical angle between the line from the muzzle of a weapon to the target and the axis of the bore when the weapon is laid for range.

ANNEX.—A document appended to and forming a part of a complete plan, order, or other document.

ANTENNA.—An electrical conductor, or system of conductors, used to transmit or receive radio waves.

ANTIGUERRILLA OPERATIONS.—Operations conducted by conventional forces against guerrilla forces in rear areas at the same time the conventional force is engaged in conventional combat operations in the forward areas.

APERTURE SIGHT.—A lensless sight by which the target is viewed through a hole, or aperture (as contrasted with an open sight having only a V-cut notch).

APPROACH MARCH.—The advance toward the enemy from the point where the zone of hostile artillery or other distant fire is entered.

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AREA DEFENSE.—A form of defense oriented toward the retention of specific terrain; area defense relies mainly on deployed forces that fire to stop and repulse the attacker.

AREA OF CONCENTRATION.—A limited area on which a volume of fire is placed within a limited time.

ASSAULT.—The final step of the attack phase; the rush to close combat with the enemy and to drive him out in hand-to-hand combat with the extensive use of bayonets and hand grenades.

ASSAULT POSITION.—A position located between the line of departure and the objective.

ASSEMBLY.—Two or more parts fastened together and not usually disassembled except for replacement.

ASSEMBLY AREA.—The area where a command assembles preparatory to making a move.

ATTACHED.—A unit is attached to another when command, operational, and administrative control of the attached unit passes from its parent unit to the commander of the unit to which attachment is made.

ATTACK.—A phase of offensive combat; offensive action directed against the enemy with the intent to kill, capture, or drive him from his position.

ATTACK POSITION.—The most forward covered and concealed position in rear of the line of departure occupied by assault units for the minimum amount of time necessary to coordinate final details and preparations for the attack.

AUTOMATIC.—The self-powered action of a weapon, using recoil, gas, or blowback operation, which produces a rapid and continuous burst of shots while the trigger is depressed.

AXIS OF THE BORE.—An imaginary center line of the bore of a gun.

AZIMUTH.—A direction in a horizontal plane.

BARRAGE.—Final protective fires of indirect fire weapons.

BARREL.—A metal tube used to direct the bullet in its line of flight.

BASE (BASE UNIT).—The element or unit in a tactical operation around which a movement or maneuver is planned and performed.

BASE OF FIRE.—One or more units that give supporting fire to an attacking unit and serve as the base around which attack operations are carried out.

BATTALION FORWARD DEFENSE AREA.—Portion of a battle area defended by frontline companies; it extends to the limit of the rearward extension of lateral boundaries of the frontline companies.

BATTERY.—The position of a weapon when cocked and its recoiling parts are forward.

BATTLE AREA.—The area in which the forward forces and their reserves are located; it is described by coordinating points, flank boundaries, and sometimes a rear boundary.

BATTLE POSITION.—The position on which the main effort of defense is, or is to be made.

BEACHHEAD.—A designated area on a hostile shore or territory which, when seized and held, ensures the continuous landing of troops and material, and provides maneuvering space for subsequent projected operations into enemy territory; the physical objective of an amphibious or airborne operation.

BEATEN ZONE.—The area on the ground or target on which the shots forming the cone of dispersion strike.

BLADE.—The front sight, usually a small piece of metal used in conjunction with the rear sight for sighting the target.

Appendix I—GLOSSARY OF COMMON MILITARY TERMS

BLOWBACK.—The energy produced in a weapon by expanding gases and powder; it forces the cartridge case rearward out of the chamber.

BOLT.—A mechanical device for blocking the breech and holding the cartridge in the chamber during firing to prevent rearward escape of gases.

BORESIGHTING.—A process by which the axis of a gun bore and the line of a gunsight are made parallel or are made to converge on a point.

BOUNDARIES.—The battalion and company defense areas that are limited because of terrain features and avenues of approach.

Company boundaries immediately forward of the FEBA assign responsibility for an avenue of approach to a company, preferably the company most threatened by the avenue. Boundaries between companies extend forward of the FEBA, but stop short of the combat outpost line (COPL). They extend to the rear far enough to provide sufficient area for the companies to organize their defense in depth.

Establishing rear boundaries may become necessary during fluid operations when infiltration and guerrilla activities are possible. Rear boundaries help the company coordinate and control its maneuvers and fires.

BREECH.—The rear end of the barrel.

BREECHBLOCK or BREECH MECHANISM.—The metal block used to seal the rear end of the bore against the force of the charge; in small arms, the breech mechanism is the bolt.

BRIDGEHEAD.—An area of ground taken and held in enemy territory.

BULLET.—The projectile of a small arms cartridge, which is discharged from a weapon toward a target.

BURST OF FIRE.—A number of shots fired automatically with a single squeeze of the trigger.

BURSTING CHARGE.—The force of an explosive that breaks the casing of a projectile to produce a demolition, fragmentation, or chemical action.

CADENCE.—A rhythmic rate of march at uniform step.

CALIBER.—The diameter of the bore measured from land to land; usually expressed in decimal fractions of an inch.

CAM.—An inclined surface that imparts a desired motion to a sliding piece. (This is generalized small arms definition.)

CANNIBALIZATION.—The act of taking a part or parts from an unserviceable piece of equipment to make another piece of equipment serviceable.

CARTRIDGE.—A small arms round ready for firing; its components are the cartridge case, primer, propellant, and bullet.

CARTRIDGE CASE.—A metal case that houses the primer and propellant and holds the bullet.

CHAMBER.—The enlarged part of the bore at the breech that holds the cartridge.

CHAMBER PRESSURE.—The pressure on the chamber walls of a weapon resulting from the expanding gases of the fired cartridge.

CHAMBERING.—The process of placing a round into the chamber of a weapon after it has been fed into the weapon.

CHANNEL.—An electrical path over which transmissions can be made from one station (unit) to another.

CHARGE.—A part of the fire command that establishes the amount of propellant to be used with a shell.

CHECKPOINT.—An easily identifiable point on the terrain that is used in controlling movement or reporting locations of friendly units.

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CIRCUIT.—A communications link between two or more points.

CIVIC ACTION.—The use of military forces on projects that contribute to the economic development of the local population. The projects concern education, training, public works, agriculture, transportation, communications, health, sanitation, and others.

CLANDESTINE (SECRET) OPERATION.—Intelligence, counterintelligence, and other similar activities sponsored or conducted by governmental departments or agencies using secret or illicit means against another nation.

CLIP.—A device that holds cartridges so that they can be loaded into a weapon.

CLOSE AIR SUPPORT.—Air operations against the enemy executed at very close range to friendly front lines.

CLOSE COMBAT.—Hand-to-hand fighting with weapons, such as bayonets, hand grenades, service rifles, or pistols.

COCKING.—The phase of operation that pertains to the locking of the hammer or firing assembly, slide assembly, or bolt group in a fixed (or held) position under spring tension and with all parts in position. Depressing the trigger will allow the firing pin to strike the primer.

COLUMN.—A formation in which the elements are placed one behind the other; a section or platoon is in column when its squads are in column and abreast.

COMBAT ORDER.—An order issued by a commander for a combat operation specifying time and date of execution.

COMBAT OUTPOST.—A security element for a battalion defensive position located approximately 1,000 to 2,500 yards forward of the main line of resistance; its primary purpose is to engage the enemy.

COMBAT PATROL.—A patrol whose primary mission is to engage actively in combat with the enemy and whose secondary mission is to gain information about the enemy and the terrain.

COMBAT PLAN.—A plan issued for a combat operation, which may be effective immediately for planning purposes or for specified preparatory action. It is not put into execution until directed by the commander in a separate order of execution, or until certain specified conditions are determined to exist. When its execution is directed, a combat plan becomes, in effect, a combat order.

COMMAND POST (CP).—The location of a unit's headquarters from which the commander and the staff operate.

COMMUNICATIONS CENTER.—An agency that is responsible for the receipt, transmission, and delivery of messages.

COMMUNICATIONS NETWORK.—A system consisting of a number of designated stations connected with one another by any means of communications.

COMMUNICATIONS SECURITY.—The protection by all measures to deny unauthorized persons information of value that might be derived from a study or receipt of communications.

COMPANY FORWARD DEFENSE AREA.—Portion of a battle area defended by frontline platoons; it extends laterally to the company boundaries, forward to the FEBA, and rearward to the supplementary positions required by the frontline platoons.

CONCEALMENT.—The protection from observation only.

CONNECTING ELEMENT.—A file or group of personnel whose mission is to maintain contact between elements of a command.

Appendix I—GLOSSARY OF COMMON MILITARY TERMS

CONSOLIDATION.—A phase of offensive combat consisting of the hasty assumption of the defense and reorganization on the seized objective.

COOK-OFF.—A cook-off is a functioning of any or all of the explosive components of a cartridge or shell caused by a weapon that has become very hot from continued firing.

CORRIDOR.—A strip of land forming a passageway between two opposing forces; in battle, no man's land.

COUNTERATTACK.—An attack by a part or all of a defending force against an enemy attacking force. The specific purpose of the attack is to regain ground lost or to cut off or destroy enemy advance units. The general objective of the attack is to deny friendly territory to the enemy.

COUNTERRECOIL.—The return of a breech mechanism to battery position after it has reached recoil limit. In small arms weapons it is usually accomplished by the release of compressed springs.

COUNTERSLOPE.—A position located on the forward slope of the next elevation to the rear of the main line of resistance.

COVER.—Any object that gives protection from enemy fire.

COVERT OPERATIONS.—Operations that are so planned and executed as to conceal the identity of the sponsor.

CRITICAL TERRAIN.—Terrain, the possession of which is vital to the accomplishment of the mission.

CRYSTAL.—A natural substance, such as quartz or tourmaline, that is used to control the frequency of radio transmitters.

CYCLIC RATE OF FIRE.—The theoretical number of rounds a weapon can fire in one minute, disregarding the limits of overheating and the capacity of the magazine.

CYLINDER.—The chamber in which the piston moves in gas-operated weapons.

DANGER SPACE.—The area between the muzzle of a direct fire weapon and the point of impact of its projectile (not to exceed the height of an average standing man).

DATE-TIME GROUP (DTG).—The date and time that identifies when a message is prepared for transmission. The DTG is expressed in six digits followed by a zone suffix—the first pair of digits denotes the date, the second pair the hours, and the third pair the minutes.

D-DAY.—The day on which an operation commences or is to commence.

DEAD SPACE.—The area within the maximum range of a weapon that cannot be covered by fire from a particular position because of intervening obstacles or because of the nature of the ground.

DEBARKATION.—The unloading of troops and equipment, or supplies, from a ship or aircraft.

DEFENSIVE POSITION.—A portion of a defense area physically occupied by troops and weapons.

DEFILADE.—A position protected from hostile ground observation and fire by a mask.

DEFILE.—A narrow place or space, such as a mountain pass, ford, or bridge, that restricts the advance of a force on a wide front or its movement to the sides.

DEFLECTION.—The setting on the scale of a gunsight to place the line of fire in the direction desired; the horizontal clockwise angle between the axis of the bore and the line of sighting.

DELAYING ACTION.—A form of defensive action employed to slow up the enemy's advance (without becoming decisively engaged) to gain time.

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DEPLOYMENT.—An extension of width or depth of a unit or both; how a unit is organized for combat.

DEPTH.—The distance from front to rear of an element, formation, or position.

DIRECT FIRE.—Fire delivered by a weapon sighted directly at the target!

DIRECT SUPPORT.—The support given directly to a specific force in response to its request for assistance.

DISPERSION.—The spreading of troops and material over a wide area to avoid offering the enemy a concentrated target; a scattered pattern of hits of bombs dropped under identical conditions or of shots fired from the same gun with the same firing data.

DISPLACEMENT.—The movement of supporting weapons or elements from one position to another.

DISTANCE.—Space between elements in the direction of depth. Between individuals, it is the space between your chest and the person to your front.

DOUBLE ACTION.—An action of depressing the trigger, as in revolvers, which cocks the hammer and then releases it to fire the weapon. Both occur on one pull of the hammer.

DOUBLE TIME.—Cadence at 180 steps (36 inches in length) per minute.

DUMP.—An area used for the temporary storage and disbursing of military supplies.

ECHELON.—A subdivision of a headquarters, such as forward echelon or rear echelon; a separate level of command; a fraction of a command in the direction of depth to which a principal combat mission is assigned, such as attack echelon, support echelon, or reserve echelon; a formation in which the elements are placed one behind another, extending beyond and unmasking one another wholly or in part.

EJECTION.—The process of expelling the empty cartridge case from a weapon through the use of an ejector.

EJECTOR.—The part that expels the empty cartridge case from the receiver of a weapon; it may be fixed, spring loaded, or movable.

ELEMENT.—An individual squad, section, platoon, company, or another unit that is part of a larger unit.

EMBARKATION.—The loading of troops, equipment, or supplies into a ship or aircraft.

EMPLACEMENT.—A prepared position from which a weapon executes its fire mission.

ENFILADE FIRE.—Fire delivered so that the long axis of the beaten zone coincides with the long axis of the target.

ENVELOPMENT.—An attack made on one or both of the enemy's flanks or rear; usually accompanied by an attack on his front.

EROSION.—The wearing away of the inner surface of a gun barrel as a result of mechanical wear and the chemical action of powder gases.

EVACUATION.—The process of moving casualties from a battlefield and subsequently of moving them along the chain of evacuation, as necessary; the clearance of personnel or material or both from a given locality.

EVASION AND ESCAPE (E&E).—The procedures and operations whereby military personnel and other selected individuals are enabled to emerge from an enemy-held or hostile area to areas under friendly control.

EXPLOITATION.—The last phase of offensive combat, which follows the reorganization of the attacking unit on the objective. In this phase of combat, the attacking unit may be directed to continue the attack, pursue the enemy, or mop up.

Appendix I—GLOSSARY OF COMMON MILITARY TERMS

EXTRACTION.—The phase of operation that deals with the removal of the empty cartridge case from the chamber of an extracting device prior to ejection.

EXTRACTOR.—The part that withdraws the empty cartridge case from the chamber of a weapon.

FEBA (FORWARD EDGE OF THE BATTLE AREA).—An imaginary line joining the forward edges of the most advanced defensive positions of the battle area.

FEEDING.—The mechanical positioning of an individual round for subsequent insertion into the chamber of a weapon during the cycle or operation.

FIELD FORTIFICATION.—Entrenchments, emplacements, and obstacles constructed in the field to increase the natural defensive strength of the terrain.

FIELD OF FIRE.—The area that a weapon or group of weapons covers effectively with fire.

FIELD STRIPPING.—Removal of the groups from a weapon; does not include disassembly of groups.

FILE.—A single column of men or vehicles one behind the other.

FINAL PROTECTIVE FIRES.—The “all-out” fires of the defending unit fired as the enemy approaches close to the frontline positions.

FINAL PROTECTIVE LINE.—A line along which interlocking bands of grazing fire are placed to stop enemy assaults. The line is placed at a predetermined distance from all available weapons fixed in direction and elevation that are capable of delivery under any conditions of visibility.

FIRE AND MANEUVER.—The close coordination of the movement of a unit with its own fire or the fire of supporting weapons. This coordination enables a portion of the unit to move forward while the remaining portion covers the forward movement by fire.

FIRE CONTROL.—All operations connected with the preparation and application of fire to a target.

FIRE DIRECTION CENTER.—The element of a command post, consisting of gunnery and communication personnel and equipment, by means of which the commander exercises fire direction and fire control.

FIRE DISCIPLINE.—The state of order, coolness, efficiency, and obedience existing among troops engaged in a fire fight.

FIRE MISSION.—A target assigned to a unit or personnel manning a certain weapon or weapons with instructions as to the time and method of firing and placing fire on the target.

FIRE UNIT.—A unit whose fire is under the immediate and effective control of one leader.

FIRING MECHANISM.—The parts of a weapon that move together to cause the cartridge primer to be struck when the trigger is depressed.

FIRING POSITIONS.—Defensive positions from which fire missions are carried out; they are designated primary, alternate, or supplementary.

FIXED FIRE.—Fire delivered on a point target.

FLANK.—The right or left extremity of a unit; the element on the extreme right or left of the line; a direction at right angles to the direction a unit is facing.

FLANK GUARD.—A security detachment that protects the flank of a body of troops on the march.

FLANKING FIRE.—Fire delivered at right angles to the enemy flank.

FLAT TRAJECTORY.—A trajectory having little or no curvature.

FORMATION.—Arrangement of the elements of a unit in line, in column, or in any other prescribed manner.

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FORWARD DEFENSE AREA.—Portion of a battle area defended by frontline companies or platoons.

FORWARD SLOPE.—The slope of elevated terrain in the direction of the enemy.

FREQUENCY.—The band on which a unit is to operate its radio communications.

FRONT.—The line of contact of two opposing forces; the length of space of an element or formation measured from one flank to the other; the direction of the enemy.

FRONTAL FIRE.—Fire delivered perpendicular to the enemy (across his front).

FUZE.—A device for setting off an explosive charge; a command or request to indicate the type of fuze action desired, such as delay, quick, or time for the 81-mm mortar.

GAS OPERATED.—The small arms principle by which gas pressure from a fired cartridge activates the operating parts of a weapon using a piston and cylinder arrangement.

GAS PORT.—A small hole drilled in the barrel to allow the expanding gases to strike the piston in the cylinder of a gas-operated weapon; sometimes called a vent.

GENERAL SUPPORT.—The support given to a force as a whole and not to any particular subdivision thereof.

GRAZING FIRE.—Fire in which the trajectory does not rise higher than the height of a man standing.

GRENADE SUMP.—A grenade sump is a circular hole large enough to accept the largest known enemy grenade; it slopes downward under the fire step in the fighting hole. Hand grenades thrown into the fighting hole are exploded in this sump; their fragmentation is restricted to the unoccupied end of the fighting hole.

GROOVES.—The depressed areas between the lands (raised surfaces) in the bore; the cutaway portion of the rifling into which the jacket or rotating band of a bullet fits to impart rotation to the bullet in its line of flight.

GROUND ZERO.—The point on the ground or directly above at which a nuclear weapon has exploded.

GROUP.—Two or more parts or assemblies that either function together in a gun or are so closely related to one another that they should be considered as a unit.

GUERRILLAS.—Combatants who are members of an organized and recognized military force whose activities normally are directed to harassing, delaying, or disrupting opposing forces; they normally wear civilian clothes.

GUIDE.—The individual (base) upon which a formation, or an element thereof, regulates its march.

HAMMER.—A lever that is swung around by spring pressure to strike the firing pin of a weapon.

HAND WEAPON.—A weapon designed to be aimed and fired with one hand; pistols and revolvers are hand weapons.

HANGFIRE.—A hangfire is a delay in the functioning of a propelling charge explosive train at the time of firing. In most cases the delay, though unpredictable, ranges from a split second to several minutes.

HEAD.—The leading element of a column.

HEADSPACE.—In small arms weapons, the distance between the face of the bolt and the base of the cartridge when it is fully chambered and the bolt is locked.

H-HOUR.—The hour an attack is to be launched, an assault wave is to land, or a movement is to begin.

Appendix I—GLOSSARY OF COMMON MILITARY TERMS

INDIRECT FIRE.—Fire delivered at a target that cannot be seen from the gun position.

INFILTRATE.—To pass troops in relatively small numbers through an opening in the enemy position or his field of fire or through territory occupied by other troops or organizations.

INITIAL POINT.—A place at which various subdivisions of a command are required to arrive at the proper time to join a marching column.

INSURGENCY.—Subversive political activity, civil rebellion, revolt, or insurrection designed to weaken and overthrow a duly constituted authority by its own people.

INSURRECTION.—A rising up against an established authority by its own people.

INTERFERENCE.—Natural or man-made radiation of electrical energy that causes difficulty in reception of radio signals.

INTERVAL.—The lateral space between elements on the same line.

JAMMING.—Deliberate interference intended to prevent reception of radio signals in a specific frequency band.

KEY TERRAIN.—Land, the possession of which could prove decisive in combat.

LANDS.—The spiral raised surface in the bore of a weapon.

LEAF SIGHT.—A type of metallic sight in which the aperture is raised to operating position by being swung upward on a hinged leaf.

LEFT (RIGHT) FLANK.—The extreme left (right) element or edge of a body of troops in relation to the enemy, regardless of the direction in which the body of troops is facing.

LIMITING POINT.—The point along a line of resistance where the responsibility of one unit stops and that of another begins. Limiting points are placed on the boundaries between companies to indicate specific localities on the ground where the battalion command wishes the company commanders to coordinate their defense.

LINE.—A formation in which the elements are abreast, except that a section or platoon is in line one behind the other when its squads are in line.

LINE OF DEPARTURE.—A line designated to coordinate the departure of attack elements.

LISTENING POST.—A one- or two-man post located forward of the battle position for the purpose of listening for enemy activity.

LOADING.—The manual procedure of inserting a magazine, clip, belt, or single round into a weapon or its feeding mechanism and the subsequent action for feeding, chambering, or cocking; the physical placing of personnel, equipment, or supplies aboard their carriers.

LOCAL SECURITY.—A security element, independent of any outpost, established by a commander to protect his unit against surprise and to ensure its readiness for action.

LOCKING LUGS.—Metal projections on the bolt that cam into recesses cut in the sides of the receiver to lock a weapon prior to firing.

LOCKING RECESSES.—Spaces cut in the sides of the receiver into which the locking lugs of the bolt are rotated into locking position.

MACHINE GUN.—An automatic rapid fire weapon fired from a mount.

MAGAZINE.—A device that stores and supplies ammunition and feeds the ammunition by means of its own spring and follower.

MAIN ATTACK.—The part of an attack where the commander concentrates the greater portion of offensive power.

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MAIN LINE OF RESISTANCE.—An imaginary line along the forward edge of the battle position designed to coordinate the fires of all units and supporting weapons.

MALFUNCTION.—The failure of a weapon to function satisfactorily.

MARCH OUTPOST.—A security echelon established by a unit on a march during short halts.

MARK.—Call for fire on a specified location to orient the spotter or observer or to indicate targets.

MASK.—A natural or artificial obstruction that gives shelter from or interferes with observation or fire.

MAXIMUM ORDINATE.—The highest point of trajectory.

MEANS OF SIGNAL COMMUNICATION.—The means by which a message is conveyed from one person or place to another.

MESSAGE.—Any thought or idea expressed in brief form or in plain or secret language; prepared in a form suitable for transmission by any means of communication.

MILITARY CREST.—The highest point near the top of a slope from which the entire valley below is visible.

MISSION.—The specific task or duty assigned to an individual, weapon, or unit.

MOUNT.—The stand on which a weapon is secured to hold it in position for rapid fire. A mount is either fixed (immovable) or flexible (movable). A flexible mount permits the weapon to move in azimuth and elevation.

MUZZLE.—The front or forward end of the barrel; the mouth of the barrel.

MUZZLE VELOCITY.—The speed at which a bullet travels when it leaves the muzzle of the barrel.

NAVAL LANDING PARTY.—A force of naval personnel organized from a ship's complement for the conduct of ground-force operations ashore.

OBJECTIVE.—The physical object of the action taken or the effect desired.

OBLIQUE FIRE.—Fire delivered from a direction that is diagonal to the long axis of the target; or fire delivered on an enemy from a direction that is between his front and flank.

OBSERVATION POST (OP).—A vantage point from which enemy activity in front of the FEBA is observed.

OBSTACLE.—Any barrier, natural or artificial, that stops or impedes the movement of a unit.

OPERATION PLAN OR ORDER.—A combat plan or order dealing with tactical operations and setting forth the mission of the unit; it deals with the commander's decision, plan of action, and such details as to the method of execution as will ensure coordinated action by the whole command.

OPTICAL SIGHT.—A sight having lenses as contrasted with one having an aperture or open sight.

ORGANIC.—Assigned to and forming an essential part of a military organization.

ORIGINATOR.—The command by whose authority a message is sent.

OUTGUARD.—The principal security element of a combat outpost.

OUTPOST.—A stationary body of troops placed at some distance from the main body while at a halt or in a defensive position. These troops protect the main body from surprise, observation, or annoyance by enemy ground forces.

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OUTPOST LINE OF RESISTANCE.—A line passing through the forward edge of the outpost positions and designed to coordinate the fires of the elements of the outpost and its supporting fires.

OVERHEAD FIRE.—Fire delivered over the heads of friendly troops.

OVERLAY.—A transparent or translucent medium upon which special military information has been plotted at the same scale of a map, photograph, or other graphic.

PACE.—The length of a full step in quick time; 30 inches.

PARTISAN.—A devoted adherent to a cause generally nationalistic in nature; the adherent may or may not be an armed combatant and is not normally a member of an organized military force.

PASSAGE OF LINES.—A rearrangement of units in which the rear unit moves forward through the already established line while the replaced unit remains in position or moves to the rear.

PATROL.—A detachment sent out by a larger unit for the purpose of gathering information or carrying out a destructive, harassing, mop-up, or security mission.

PAWL.—A part of the feeding device on a machine gun that permits feeding of the ammunition belt into the weapon; it holds the belt securely so that it will not move in reverse direction.

PENETRATION.—An attack that puts the main attacking force through the enemy's principal defensive position.

PHASE LINE.—A line used for control and coordination of military operations; it is usually a terrain feature extending across the zone of action.

PIECE.—Any firearm.

PLUNGING FIRE.—Fire that strikes the ground at a sharp angle.

POINT.—The security element that forms the leading element of an advance guard, or the rear element of the rear guard.

POINT OF DEPARTURE.—The point on the line of departure at which an attacking force in column crosses.

POINT OF DRESS.—The point toward which all elements of a unit establish their alignment.

POLITICAL WARFARE.—Aggressive use of political means to achieve national objectives.

POSITION.—The location of a gun, unit, or individual from which fire can be delivered upon a given target.

POST.—The prescribed limits of a sentry's responsibility.

PREARRANGED FIRE.—Supporting fire for which the fire data is prepared in advance. It is delivered on a time schedule or on-call from the support troops.

PRINCIPAL DIRECTION OF FIRE (PDF).—A specific direction within the sector of fire of a flat-trajectory weapon, which is designated as its primary fire mission. Within a rifle platoon, automatic weapons are assigned a PDF. Units are not assigned PDFs nor can a weapon be assigned more than one PDF.

PROBABLE LINE OF DEPLOYMENT.—The location on the ground where the commander of a force plans to complete final deployment prior to moving out with squads as skirmishers.

PROPAGANDA.—Any information, ideas, doctrines, or special appeals spread to influence the opinions, emotions, attitudes, or behavior of any specified group to benefit the sponsor, either directly or indirectly.

PROPELLING CHARGE.—An explosive that throws the projectile from a gun.

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PROTECTIVE FIRE.—Fire delivered by supporting weapons and directed against the enemy for the purpose of hindering his fire or movement against friendly attacking units.

QUICK TIME.—Cadence at 120 steps (12, 15, or 30 inches in length) per minute.

RADIO CHANNEL.—A band of adjacent frequencies having sufficient width to permit its use for radio communications.

RAID.—An operation, usually small scale, involving a swift penetration of hostile territory to secure information, confuse the enemy, or destroy his installations. The operation ends with a planned withdrawal upon completion of the assigned mission.

RANK.—A line of men or vehicles placed side by side; officer's grade or position.

REAR.—The direction away from the enemy.

REAR AREA.—The area in the rear of the combat and forward areas.

REAR GUARD.—The security element that follows and protects the rear of a marching force.

REBELLION.—Organized, armed, open resistance to the authority or government in power.

RECONNAISSANCE PATROL.—A patrol whose mission is to gain information about the enemy and the terrain.

REGISTRATION.—The adjustment of fire to determine firing corrections.

RELAY.—A transmission forwarded through an intermediate station.

RELEASE POINT.—A point at which a higher command releases control of a unit to its commander.

RELIEF OF FRONTLINE UNITS.—A rearrangement of units in which the rear unit moves forward to the battle position and occupies the defensive positions there; at the same time the forward unit in the battle position relinquishes these positions and moves to the rear.

REPEAT.—A command or request to fire again the same number of rounds with the same method of fire.

RESERVE.—An element of the battalion or higher unit, held initially under the control of the commander as a maneuvering element to influence future action.

RESERVE AREA.—The area that extends from the rear of the forward defense area to the rear of the battle area. The RESERVE FORCE is located in the reserve area.

RETIREMENT.—An operation in which a force withdraws without enemy pressure to avoid combat under the existing situation.

RETROGRADE MOVEMENT.—Any movement of a command to the rear, or away from the enemy, whether forced by the enemy or voluntary, including a withdrawal, retirement, or delaying action.

REVERSE SLOPE.—Any slope which descends away from the enemy.

REVOLT.—A casting off of allegiance or a refusal to submit to established authority.

REVOLUTION.—A rebellion that succeeds in overthrowing an old government and establishing a new one.

RIGHT (LEFT) FLANK.—The extreme right (left) element or edge of a body of troops, in relation to the enemy, regardless of the direction in which the body of troops is facing.

ROADBLOCK.—A barrier or obstacle to block or limit the movement of hostile vehicles along a road.

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ROUTE MARCH.—The advance in column on roads.

SCREEN FIRE.—A curtain of smoke that protects a force from enemy ground observation.

SEARCHING FIRE.—Fire distributed in depth by successive changes in elevation of a weapon.

SECTION.—A military unit that is smaller than a platoon and larger than a squad; the basic tactical unit in the weapons platoon of the rifle company.

SECTOR.—A clearly defined area that a given unit protects or covers with fire.

SECTOR OF FIRE.—A section of terrain designated by boundaries that is assigned to a unit or to a weapon to cover by fire.

SECURITY.—Measures taken by a command to protect itself from espionage, observation, sabotage, annoyance, or surprise.

SECURITY AREA.—The area forward of the FEBA assigned to a battalion or company. A battalion's security area extends to whatever distance security forces uncontrolled by the battalion are employed. A company's security area extends 400 to 500 yards (maximum effective range of small arms fire) to the most forward extension of the company's lateral boundary.

SHOCK ACTION.—Actual hand-to-hand combat between opposing troops; an offensive movement by fast-moving forces in which they tend to overrun the enemy by the force of their own momentum.

SHORT.—A spotting or an observation used by a spotter or an observer to indicate that a burst fell SHORT of the target in relation to a line perpendicular to the spotting line.

SITREP.—A situation report.

SKETCH.—A hasty pictorial drawing showing only desired map features and objects in relative position, usually for a specific use.

SKIRMISHERS.—A line of troops in extended order during a tactical exercise or attack.

SNAP.—In commands or signals, the quality that inspires immediate response.

STATIC.—Any electrical disturbance in your radio communications caused by atmospheric conditions.

STEP.—The distance from heel to heel between the feet of a marching man; normally 30 inches.

SUPPLEMENTARY POSITION.—An extra position other than the designated primary or alternate position.

SUPPLY POINT.—Any point where supplies are issued (for example, depot, railhead, truckhead, airhead, or navigation-head).

SUPPORT.—The action of a force that aids, protects, complements, or sustains another force in accordance with a directive requiring such actions; a unit that helps another unit in battle; the reserve of a rifle company or platoon in the attack or defense; an element of a command that assists, protects, or supplies other forces in combat.

SUPPORTING FIRE.—Fire delivered by weapons of supporting units to assist or protect a unit in combat.

SUPPORTING WEAPONS.—Weapons other than those with which a rifle unit is normally equipped.

TERRAIN.—An area of ground, considered as to its extent and natural features, in relation to its use in a particular operation.

TOPOGRAPHICAL CREST.—The highest point on elevated terrain.

TRAJECTORY.—The path described by any projectile in flight.

TRAVERSING FIRE.—Fire distributed in width by successive changes in direction of a weapon.

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UNDERGROUND.—A civilian organization that supports the resistance movement through covert (secret) actions. Such actions include intelligence collection, subversion, sabotage, terror, assassination, and dissemination of propaganda in areas denied to the guerrilla force.

UNIT.—Any military force having a prescribed organization.

UNIT OF FIRE.—A unit of measure for ammunition supply. It represents a specific number of rounds of ammunition per weapon.

WEDGE FORMATION.—A tactical formation in the form of a V with the point toward the enemy; a formation with elements in echelon to the right and left rear. Also called a V-formation.

WITHDRAWAL.—A movement whereby a force disengages from an enemy force in accordance with the will of the commander.

ZONE OF ACTION.—A geographical area within which a military unit is to act, and for which it is responsible.

ZONE OF FIRE.—An area into which a particular unit delivers, or is prepared to deliver, fire.

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